Technological University Dublin
ARROW@TU Dublin

Theses

School of Media

2023

Game Design Learning: Understanding and Supporting the Game Design Process in Higher Education

John Healy
john.p.healy@tudublin.ie

Follow this and additional works at: https://arrow.tudublin.ie/aaschmedthes

 Part of the Game Design Commons, and the Scholarship of Teaching and Learning Commons

Recommended Citation

Healy, John, "Game Design Learning: Understanding and Supporting the Game Design Process in Higher Education" (2023). *Theses*. 4.
https://arrow.tudublin.ie/aaschmedthes/4

This Theses, Ph.D is brought to you for free and open access by the School of Media at ARROW@TU Dublin. It has been accepted for inclusion in Theses by an authorized administrator of ARROW@TU Dublin. For more information, please contact arrow.admin@tudublin.ie.



This work is licensed under a Creative Commons Attribution-NonCommercial-Share Alike 4.0 International License.

Game Design Learning

Understanding and Supporting the Game Design Process in Higher Education



John P. Healy

Supervisors: Dr Charlie Cullen

Dr Pauline Rooney

School of Media

Technological University Dublin

This thesis is submitted in partial fulfilment for the degree of

Doctor of Philosophy

Faculty of Arts & Humanities October 2023

Abstract

This thesis presents a study of the game design process in higher education. The PhD research makes several contributions to the field by developing a model of game design learning through the analysis of qualitative data and creating a number of learning supports informed by this model. The research also proposes the signature pedagogy of game design learning as the studio project and explores the relationship between game design and other design disciplines. These contributions advance the understanding and practice of game design education, benefiting researchers, educators, and designers.

As the popularity of digital games has grown in the 21st century, so has the provision of higher education programmes in game design. However, our understanding of the game design process and pedagogical approaches to it arguably remain limited. This project seeks to gain a deeper understanding of the game design learning process within higher education. This research is situated within the sub-discipline of game design research, combining the practices and theories of design with the game design process.

The research involved two interview studies, an observational study and a series of educational interventions. The first interview study was conducted with practising game designers to understand the practice of game design. A follow-up study was conducted with game design educators to understand the structuring of game design learning within higher education. The observational study involved the analysis of design outputs such as games, fieldnotes and developer logs from a 6-week student game design project. Informed by this knowledge a model of game design learning was developed, leading to a series of educational

supports that were created for use within the game design classroom. The findings provide an understanding of game design learning and supports for use within game design education.

Declaration

I certify that this thesis which I now submit for examination for the award of Doctor of Philosophy is entirely my own work and has not been taken from the work of others, save and to the extent that such work has been cited and acknowledged within the text of my work.

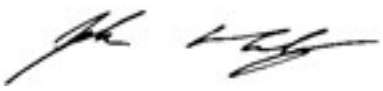
This thesis was prepared according to the regulations for graduate study by research of Technological University Dublin and has not been submitted in whole or in part for another award in any other third level institution.

The work reported on in this thesis conforms to the principles and requirements of the TU Dublin's guidelines for ethics in research.

TU Dublin has permission to keep, lend or copy this thesis in whole or in part, on condition that any such use of the material of the thesis be duly acknowledged.

John P. Healy

October 2023



To my parents Lily and Denis,

I miss you.

To my wife, Emma, and my boys, Finn and Oran,

I love you.

Acknowledgements

This research journey began shortly after I joined the Dublin Institute of Technology (now TU Dublin) in 2015. Following a meeting with my then Head of Department, Dr Charlie Cullen, who would soon become the primary supervisor of this thesis, I embarked on this PhD. I would not have made it to this stage without his guidance, support and, more than anything, his belief that I would get this done. Thank you, Charlie, for the meetings, discussions and patience as this research found its eventual direction!

I would also like to thank Dr Pauline Rooney, who co-supervised the PhD from 2016-2019, for the many discussions on the research topic. Your support and guidance are a massive part of how I got here today; thank you, Pauline!

I am lucky to have numerous colleagues within the School of Media who have helped me to develop as an academic in uncertain times; thank you all. In particular, I would like to thank Basil Lim, Dr Keith Gardiner, Dr Brian Vaughan, and Evin McCarthy for the many conversations over the past 8+ years. I would also like to thank my colleagues within game studies for many conversations and discussions which helped to shape this research.

To all the game designers and educators who took the time to share their experiences and knowledge anonymously, thank you, this research is a testament to your generosity. To the students who opted-in to this research, thank you for helping me learn and develop. To all the students I've taught over the years, thank you for shaping who I am today!

This PhD research has meant sacrificing time with my family, being irritable and, at times, anxious; thank you for your understanding. To my mother-in-law, Breda Creighton,

thank you for all the child-minding that gave me the space and time to complete this work. To my two boys, Finn and Oran, you did everything you could to stop me from getting this PhD done, but who has the last laugh now? Finally, I would like to thank my wife, Emma, who was subjected to more conversations about game design education than anyone deserves. For all the sacrifices you made to enable me to complete this research. Thank you for your support, feedback, encouragement and love.

Research Outputs

Book Chapters

Healy, J. P., & Cullen, C. (2023). If found... In K. Schrier, R. Kowert, D. Leonard, & T. Porkka-Kontturi (Eds.), *50 games to use for inclusion, equity, and justice.* Carnegie Mellon University: ETC Press.

Conference Papers

Healy, J. P., & Cullen, C. (2022a). Towards a model of the design process for games. *DiGRA 2022 - Proceedings of the 2022 DiGRA International Conference*.

Healy, J. P., & Cullen, C. (2022b). Navigating complexity: Investigating how students move through the game design process. *In FDG '22: Proceedings of the 17th International Conference on the Foundations of Digital Games (FDG '22)*. https://doi.org/https://doi.org/10.1145/3555858.3555905

Healy, J. P., Cullen, C., & Rooney, P. (2016). Towards a framework for computer-mediated debriefing in interactive game-based exhibits. *Irish conference on game-based learning*, 17–23.

Conference Presentations

Gannon, N., Healy, J. P., O'Reilly (Chair), G., & Williams, D. (2018). The gap between game development and education. *Dublin games summit 2018*.

Healy, J. P. (2016). Irish play culture. *The state of play: Game conference and festival 2016*.

Healy, J. P., & Cullen, C. (2022). Design heuristics as a pattern approach to idea generation. In *Gameplay design patterns approaches - DiGRA22 [workshop]*.

Healy, J. P., Cullen, C., & Rooney, P. (2016). Approaches to teamwork in game development education. *Picteilín 2016 creative media and game studies conference*.

Healy, J. P., Cullen, C., & Rooney, P. (2018). Debriefing in game-based learning. *The state of play: Game conference and festival 2018*.

Healy, J. P., Lim, B., & Cullen, C. (2019). Half professional, half real. *Irish conference on game based learning 2019*.

Conference Workshops

Healy, J. P., & Cullen, C. (2022a). Design research methodology (DRM) as an approach to study the game design process. *Proceedings of the Irish Conference on Game-Based Learning*.

Healy, J. P., & Cullen, C. (2022b). Game development projects in an academic context. In *Developing digital games in and for academic contexts - FDG22 [workshop]*.

Glossary

AAA Used to refer to large studios producing big budget games and distributed by large publishers.

Designerly Acting in the manner of a designer, thinking with a focus on design.

DRM Stands for Design Research Methodology developed by Blessing and Chakrabarti (2009) as an approach to study and support design processes..

Game Design Learning The process of formal training in game design, often within higher education.

Game Engine A game engine is a software tool that includes commonly used game development features such as rendering, physics, lighting, etc..

Gameplay The term gameplay refers to the runtime playing of a game by players.

Indie Refers to small-scale, independent developers, making games of a significantly smaller scale than AAA.

Level Design The act of designing the spaces within which the gameplay will take place.

Mechanics The formal rules/systemic elements of a game.

Scope The scale of the development challenge, a large scope refers to an ambitious game whereas a small scope would refer to a more achievable goal.

Contents

Table of Contents **xii**

List of Figures **xviii**

List of Tables **xxii**

1 Introduction **1**

1.1 Background 2

1.2 Overview of the Research 4

1.3 The Role of the Researcher 6

1.3.1 Designer 6

1.3.2 Educator 7

1.4 Research Approach 8

1.5 Aims and Objectives 12

1.6 Research Contribution 13

1.7 Dissemination 15

1.8 Outline of the Thesis 17

1.9 Conclusion 19

2 Understanding Game Design **20**

2.1 Game Design Practice 21

2.1.1 The Game Design Process 23
2.1.2 Innovation in the Game Industry 33
2.1.3 Creativity in Game Design 35
2.2 Game Design Education 41
2.2.1 Game Development in Higher Education 42
2.2.2 Game Design Supports 48
2.3 Game Design Research 52
2.3.1 Design as Discipline 55
2.3.2 Models of the Design Process 58
2.4 Conclusion 63

3 Methodology **64**
3.1 Theoretical Perspective 64
3.2 Research Methodology 67
3.3 DRM: Design Research Methodology 71
3.3.1 Research Clarification 76
3.3.2 Descriptive Study 76
3.3.3 Prescriptive Study 78
3.4 Data Collection 79
3.4.1 Ethical Research 79
3.4.2 Insider research 80
3.4.3 Sampling 81
3.4.4 Methods 82
3.4.5 Data Recording and Storage 85
3.5 Thematic Analysis 86
3.5.1 Transcribing Data and Familiarisation 88
3.5.2 First Cycle Coding 88

3.5.3 Second Cycle Coding 91
3.5.4 Reviewing and Refining Themes 93
3.6 Conclusion 94

4 The Practice of Game Design 96
4.1 Objectives 97
4.2 Research Design 97
4.3 Findings 100
4.3.1 Cycles of Implementation and Iteration 102
4.3.2 Design Approaches 106
4.3.3 Communication and Collaboration 118
4.4 Conclusion 122

5 Structuring Game Design Learning 125
5.1 Objectives 126
5.2 Research Design 126
5.3 Findings 129
5.3.1 Experiencing the Process 131
5.3.2 Supporting Game Design Learning 137
5.3.3 Communication and Collaboration 145
5.3.4 Structuring Game Design Learning 149
5.3.5 Developing Design Expertise 156
5.4 Conclusion 159

6 Experiencing Game Design Learning 163
6.1 Objectives 164
6.2 Research Design 164
6.3 Findings 168

6.3.1 The Context and Complexity of Game Design 170
6.3.2 Applying Design Approaches 177
6.3.3 Communication and Collaboration 187
6.3.4 Initiating the Game Design Process 190
6.3.5 Game Design Outcomes 195
6.4 Conclusion 200

7 Supporting Game Design Learning 204
7.1 Objectives 205
7.2 A Model of Game Design Learning 205
7.3 Game Ideation 210
7.3.1 Background 211
7.3.2 Implementation 213
7.3.3 Reflection 218
7.4 If Found... 220
7.4.1 Background 220
7.4.2 Implementation 222
7.4.3 Reflection 226
7.5 Game Tools 2 229
7.5.1 Background 229
7.5.2 Implementation 231
7.5.3 Reflection 234
7.6 Conclusion 237

8 Conclusion 240
8.1 Overview of the Research 240
8.2 Contributions of the Research 242

8.3 Limitations of the Research 249
8.4 Problems Arising 250
8.5 Future Work 251
8.6 Reflective Account 253
8.7 Conclusion 254

References **256**

Appendix A Project Information Sheets **270**

A.1 Interview Participant Project Information Sheet 271
A.2 Student Participant Information Sheet 274

Appendix B Consent Forms **280**

B.1 Interview Consent Form 281
B.2 Student Consent Form 282

Appendix C Interview Protocols **284**

C.1 Game Designer Protocol 285
C.2 Game Design Educator Protocol 289

Appendix D Game Designer Qualitative Coding **292**

D.1 In-Vivo Codes and Categories for Practitioners 293
D.2 Code Mapping for Practitioners 299
D.3 Theoretical Map for Practitioners 300

Appendix E Game Design Educator Qualitative Coding **301**

E.1 In-Vivo Codes and Categories for Educators 302
E.2 Code Mapping for Educators 313
E.3 Theoretical Map for Educators 314

Appendix F Student Qualitative Coding **315**

F.1 Line-by-Line Codes and Categories for Students 316

F.2 Axial Coding for Students 322

F.3 Theoretical Map for Students 323

Appendix G Game Tools Project Brief **324**

Appendix H Development of Initial Game Design Heuristic Set **327**

H.1 Game Data Gathered For Heuristic Development 328

H.2 Initial Heuristics Set Developed to Trial Game Ideation Tool 337

List of Figures

1.1 The research explores the overlapping areas of game studies, design studies and education. 9
1.2 The DRM research approach applied in this PhD involves three stages with multiple phases of study taking part within the Descriptive Study 11

2.1 Lemarchand (2021, p. 18) describes game development as being split between ideation, preproduction, full production, and postproduction. . . . 25
2.2 The three stages of game development from Adams (2010, p. 45) show how a project moves from concept to elaboration and finally to tuning stages. . . 26
2.3 A sample one-page design document for a role-playing game by Librande (2010, p. 26) provides an alternative to linear documentation. 29
2.4 A sample game design storyboard by Librande (2010, p. 50) suggests further alternatives for game design documentation. 30
2.5 The game design concept model by Hagen (2009, p. 4) highlights the nature of game concepts as including both innovative and recycled elements. . . . 38
2.6 The game design concept model by Sánchez et al. (2021, p. 207) describes game concepts as arising from three different processes; mash-up, transformational and exploratory. 39
2.7 The conceptualise phase of the game design process by Macklin and Sharp (2016, p. 356) highlights the exploratory nature of this phase. 49

2.8 Sample of Verb Noun Adjective Cards (VNA Cards), Kultima (2017, p. 3) used to aid game designers in developing novel concepts. 50
2.9 Design as a distinct discipline from humanities and science, from Archer (1979, p. 20). 56
2.10 The design process model by Lawson (2010, p. 49) shows the three activities of analysis, synthesis and evaluation as activities occurring between the design problem and solution. 60

3.1 The DRM framework by Blessing and Chakrabarti (2009, p. 15) showing the potential stages in a design research project, the means employed and the main outcomes. 73
3.2 A sample in-vivo code highlighting the code of "*Calendar Time*" as a significant concept for this designer. 89
3.3 A sample of line-by-line coding highlights multiple codes emerging from a short DevLog extract. 90
3.4 A sample of focused coding highlighting how the theme of "*FOCUSING ON A PROCESS*" emerged from related codes. 92
3.5 Axial coding conducted using Post-it notes and line-by-line codes. 92
3.6 Code mapping of the data from the practitioner interviews helped to identify the relationships between concepts. 93

4.1 The research presented in this chapter is the first phase of the descriptive study conducted. 98
4.2 Framework of the Design Process Based On Interview Analysis. The framework highlights cycles of iteration and implementation as the core of the game design process, with designers using a variety of approaches mediated through communication and collaboration. 101

5.1 The research presented in this chapter is the second phase of the descriptive study conducted. 127

5.2 Framework of the Game Design Learning Process Based on Interview Analysis. The framework places students experiencing a structured process at the centre, with developing design expertise as the output. While moving through the process, students and educators approach the learning process through communication and collaboration. 130

6.1 The research presented in this chapter is the third and final phase of the descriptive study conducted. 165

6.2 The theoretical framework for Student Design Process based on data analysis. The model proposes design is initiated, takes place within a context, and leads to outcomes. During the design process, students apply a variety of design approaches mediated through communication and collaboration. . . 169

6.3 Example of game inventory design created by Team 3. 171

6.4 Student design work on inventory and user interface elements. 181

6.5 Level Design Process showing white box designs (1, 2) and the final design with art in place (3). 184

7.1 The Game Design Learning Model. Authentic design experiences exist between design initiation and outcome, involve analysis, synthesis and evaluation, and finally occur within a design context. 206

7.2 The model of game design learning presents activities as examples of designerly activity within the design process. 208

7.3 Concept development for physical game ideation cards. 214

7.4 The prompt page shows the prompt title and description. 216

7.5 The examples page includes sample games, an animated gameplay GIF, a description and link. 217

7.6 A page from Kasio's diary showing the hand-drawn art style that is used throughout the game. 224

7.7 The structure of the learning unit with activities conducted at each stage. . . 225

8.1 The Game Design Learning Model as presented in Chapter 7. 244

List of Tables

1.1 Methods employed in answering each research question. 13

3.1 The eight "Big-Tent" criteria for excellence in qualitative research, from Tracy (2010, p. 840). 68

3.2 The stages of the research detailing the type, goal, methods and outcome. . 75

3.3 The methods employed through each phase of the descriptive study. 83

4.1 Participant ID, experience and job title of game designers interviewed . . . 99

5.1 Participant ID, experience and job title of educators interviewed 128

6.1 Mapping the criteria for game development projects to the Game Tools 2 project. 167

7.1 Elements of the game design learning model and examples from practice. . 209

7.2 Overview of Game Tools 2 before and after the module revision. 232

8.1 Relationship between research questions and contributions. 243

Chapter 1

Introduction

> *Today was the first class in the major project module, and I structured it as a briefing presentation followed by a Q & A session. I began by prompting students to share their expectations for the year ahead. Students proposed that successful projects were: professional, complete, well-polished, released, and ideally would earn money.*
>
> *I worry that the students are focusing on the technical rather than the creative aspects of the field. To prompt discussion, I asked students if a project that took a risk but failed to execute well was more or less successful than a project that played it safe. I was surprised that universally the students favoured the project that played it safe and viewed the risky project as a failure. This group of students have produced numerous exciting projects in the past, yet there seems to be an apparent aversion to risk. Where are we going wrong?*
>
> (Fieldnote, 17th September 2018)

The above fieldnote, from early in the research project, captures a common experience that I have encountered in the game design classroom at *Technological University Dublin*[1] (TU Dublin). My students often appear to be risk-averse and focused on execution over creativity or originality even when prompted to focus on conceptual design. As an educator, I feel we lack an understanding of how to support our students in acquiring game design

[1] In January of 2019 the Dublin Institute of Technology merged with the Insititute of Technology Blanchardstown and Insititute of Technology Tallaght to form Technological University Dublin. Work completed prior to this date took place at the Dublin Institute of Technology.

expertise. This thesis investigates game design learning[2] in the context of higher education, and it seeks to improve classroom practice through the application of this knowledge. It is a response to my personal experience as a lecturer and draws on my experience as both a game designer and educator. For over ten years, I have taught game design to hundreds of students from primary and secondary school to undergraduate and postgraduate levels. While inspired by the students' hard work and determination, I have become increasingly aware that what we know of the game design process and how to teach it, is arguably still limited. This research aims to contribute to a broader understanding of game design learning and presents a series of learning supports for use within the context of higher education. In addition to this, the research aims to develop a model of game design learning as a diagnostic tool to stimulate reflective practice among game design educators. The model seeks to build a shared understanding of game design within higher education and facilitate discussion and reflection on classroom practice.

This introductory chapter first outlines the background details of the project and the role of the researcher. Then it describes the nature of the research approach adopted, the aims, objectives and contribution of the project. Finally, it provides a list of outputs arising from the research and an outline of the thesis structure.

1.1 Background

As a game design educator, I have frequently encountered situations where students design games based on their knowledge of game authoring and development tools such as Unity (www.unity.com), Unreal (www.unrealengine.com). It became apparent to me that many of my students tended to become attached to ideas (often long-held game concepts) and found it challenging to move beyond these, even with encouragement and classroom support. While

[2] I use the term *game design learning* throughout this thesis to refer to structured education of game designers, specifically in the context of higher education.

proficiency with development tools is an important aspect of our curriculum the ultimate goal of our programme is to develop game design expertise. Related research on the impact of computer-aided design (CAD) software tools on creative problem-solving in engineering design suggests that novice users of CAD software risk becoming fixated and not fully exploring the design space (Robertson & Radcliffe, 2009). This indicated that the fixation I observed in the game design classroom shared similarities with the experiences of educators in other design disciplines.

This experience with student fixation and its significance within the design literature (Crilly, 2019) presented an opportunity to better understand and support students in developing game design expertise. Game design textbooks often focus on high-level activities, such as generating ideas, prototyping, testing and iterating (Adams, 2010; Fullerton, 2019; Lemarchand, 2021), however, they rarely focus on the design process at the level of designerly[3] activity. This gap in students' awareness of the game design process at a practical level can be contrasted with their knowledge of development tools. There is no shortage of textbooks, YouTube videos (www.youtube.com) and other online learning resources for game development tools. The volume of these resources and their focus on technical implementation arguably leaves little room for designerly practice.

This sparked my interest in the game design learning process and specifically how to make the tacit knowledge of game design explicit in the classroom. The book *Designerly Ways of Thinking* (2006) by design researcher Nigel Cross was particularly influential in this realisation. The book helped me to think more deeply about both the game design process as well as the roles of the game designer and educator within it. I have come to refer to the following quote regularly throughout the research as a motivation for the project:

[3]The term *designerly* is used throughout this thesis to refer to the mode of thought specific to design. As outlined by Cross, "*designerly ways of knowing rest on the manipulation of non-verbal codes in the material culture; these codes translate 'messages' either way between concrete objects and abstract requirements; they facilitate the constructive, solution-focused thinking of the designer, in the same way that other (e.g. verbal and numerical) codes facilitate analytic, problem-focused thinking; they are probably the most effective means of tackling the characteristically ill-defined problems of planning, designing and inventing new things*" (1982, p. 225). This topic is discussed further in the following chapter (Understanding Game Design).

> *What designers know about their own problem-solving processes remains largely tacit knowledge — i.e. they know it in the same way that a skilled person 'knows' how to perform that skill. They find it difficult to externalise their knowledge, and hence design education is forced to rely so heavily on an apprenticeship system of learning. It may be satisfactory, or at least understandable, for practicing designers to be inarticulate about their skills, but teachers of design have a responsibility to be as articulate as they possibly can about what it is they are trying to teach, or else they can have no basis for choosing the content and methods of their teaching.*
>
> (Cross, 2006, p. 25)

From this starting point, I began to investigate how game design happens in practice, how we teach this in the classroom context, and how students engage with this process. The following section provides a brief overview of the research conducted during the course of this PhD project.

1.2 Overview of the Research

The project began with a review of the literature relating to existing research on the game design process, game design education, and game design research. Within design studies, design process and methodology has been one of the main strands of research since the field's inception (Jones, 1963). This existing corpus of designerly activity arguably presents an opportunity for game studies scholars to draw on knowledge and insights from related design disciplines to inform our approach to both studying and teaching the game design process.

As Annakaisa Kultima (2015) highlights, much of the academic literature related to games has historically focused on the content of games and those that play them, with little consideration being given to the processes used by game designers. Similarly, Malazita and O'Donnell (2023) propose that a combination of critical studies, game studies and game design could lead to new research opportunities and create new avenues to explore the phenomenon of game design. These researchers suggest that by drawing on literature

and experiences from related design disciplines we can uncover new insights into the design process and arguably thereby improve game design learning.

Following the literature review, a number of research questions emerged as outlined below in section 1.5 (Aims and Objectives). To answer these questions I followed the structure of the *Design Research Methodology*[4] (Blessing & Chakrabarti, 2009) where a comprehensive *descriptive study* was carried out to understand the game design learning process. The first phase involved interviewing practising game designers with experience across a spectrum of game genres[5] and scales in order to understand the practice of game design. Following this I interviewed game design educators in the UK and Ireland to gain an understanding of how lecturers structure the game design learning process. The final phase involved observation within a game design classroom and was conducted to identify how student learning takes place within the signature pedagogy[6] (Shulman, 2005) of game design, the studio project. These phases of the descriptive study provided an understanding of the game design learning process. The final, or *prescriptive study*, involved the development of a model of game design learning and the implementation of a series of game design learning supports that were applied within my teaching practice to transfer prior fieldwork outputs to classroom practice.

Overall, the research has sought to shed light on the tacit knowledge within game design education and to provide insights into how student designers approach and navigate the design process within the context of higher education. It aims to contribute to a deeper understanding of this complex and dynamic field and will hopefully be of value to designers

[4]The Design Research Methodology, or DRM, is a research methodology intended to provide structure to research projects that seek to develop supports within design processes. It involves multiple phases of research including: Research Clarification, Descriptive Study (I/II), and Prescriptive Study. The methodology is discussed in more detail in chapter 3 (Methodology).

[5]A game genre refers to a type of game with similar characteristics shared across multiple games. As outlined by Clara Fernández-Vara game genres can be difficult to define in concrete terms as "*genres are usually associated with a series of conventions, which are in constant transformation and create new genres*" (2019, p. 67).

[6]Signature pedagogies refer to styles of instruction and teaching that are common within a discipline. Lee S. Shulman describes them as the "*types of teaching that organize the fundamental ways in which future practitioners are educated for their new profession*" (2005, p. 52).

and educators alike. By better understanding how designers think and work, we can create more effective and engaging learning experiences and better support the needs of student designers as they work towards professional practice. As outlined above, this research is based on my experience as a designer and educator. The following section will describe my role in the research from both perspectives.

1.3 The Role of the Researcher

This research was conducted as a qualitative inquiry, and within this paradigm, "*it is both the researcher and the research participants who co-create the findings*" (Waller et al., 2015, p. 14). As the role of the researcher is important within the overall context of the project the following sections will outline my experience as a designer/educator and how they have shaped my approach to this project.

1.3.1 Designer

I hold a Bachelor of Science (Honours) in Product Design and Technology and a Master of Science in Digital Games. I have worked professionally as a design engineer and game designer, and maintain a practice through game design consultancy and personal projects. Conducting the research through a design-based methodology was chosen as my educational and professional backgrounds are within the discipline of design. Specifically, my background as a product designer was the starting point for this research as I had observed a difference between my experiences as a design student and what I was then observing in the game design classroom.

As an undergraduate design student, I was encouraged to focus on developing a breadth of concepts and fully exploring a design space when working on projects. However, within the game design classroom, I observed students moving quickly towards ideas and then

developing games without much exploration of the wider possibility space. While this was sometimes successful, it often led to concepts with limited variety, derived from existing genre norms.

Design-based methodologies in game design, as defined by game design research (Lankoski & Holopainen, 2017) and critical game design (Malazita & O'Donnell, 2023), were identified as appropriate approaches for conducting this research for several reasons. Firstly, it aligned with my own epistemological and ontological beliefs as I have approached this work from a background in design and was looking to understand a design phenomenon. Secondly, as a growing aspect of game studies, it provided an opportunity to contribute to an emerging understanding of how game design and education occur in practice. The following section will discuss my experience as an educator.

1.3.2 Educator

I also bring experience as an educator to the project, with a Postgraduate Diploma in Higher Education and experience working as a lecturer in game design since 2012. During the Postgraduate Diploma, I published a review paper on the role of the *crit*[7] within art and design education (Healy, 2016). In this work, I explored the role of one of the signature pedagogies of art and design education. I identified the core elements of the design crit that can be adapted to support the student learning experience. This research impacted my teaching practice as I brought these findings and best practices for feedback and critique to the game design classroom.

As a game design educator, I take a practice-based approach in my teaching by encouraging students to engage in the process of game design and then to reflect on their experiences. During this process of being immersed in the production of games through

[7]The crit is an educational approach within art and design that can take a number of different formats. Within the paper, I describe the crit as an approach where students "*communicate their design intent and enter into a discussion of their work with tutors, peers, and in some cases external stakeholders such as industry practitioners, clients, and community members*" (2016, p. 2).

authentic design tasks, students acquire game design expertise. Reflecting on their learning encourages students to consider what they have learned, both to take forward into future projects and also to help develop their own creative voice within game design. However, to be better able to support the acquisition of these skills, I wanted to gain a deeper insight into the design practice so that students learning to design games could receive more targeted support to enable their development as creative practitioners.

As outlined previously, it was within the context of my role as an educator that the gap between general methods of design education and game design education became apparent. In particular, journals such as the International Journal of Art & Design Education (onlinelibrary.wiley.com/journal/14768070) provide high-level venues for research into art and design education. Within game studies, however, research on teaching is often spread across conferences and journals with varied disciplinary concerns.

As the research was conducted through a qualitative approach, this positioning of the researcher within the work may help the reader understand the research process. The following section describes the nature of the inquiry and the qualitative approach that was taken.

1.4 Research Approach

The research has been undertaken from the perspective of design and specifically the game design research paradigm, where the practices, processes, and methods of the discipline of design are applied to research on games. Figure 1.1 shows the domains of the research across these three areas: game studies, education, and design.

For game studies, research has largely been performed within the domains of the humanities and computer science. However, Lankoski and Holopainen (2017) argue that the study of game design practice should also be considered through the discipline of design studies. Kultima (2015) proposes looking at the process of game design through general

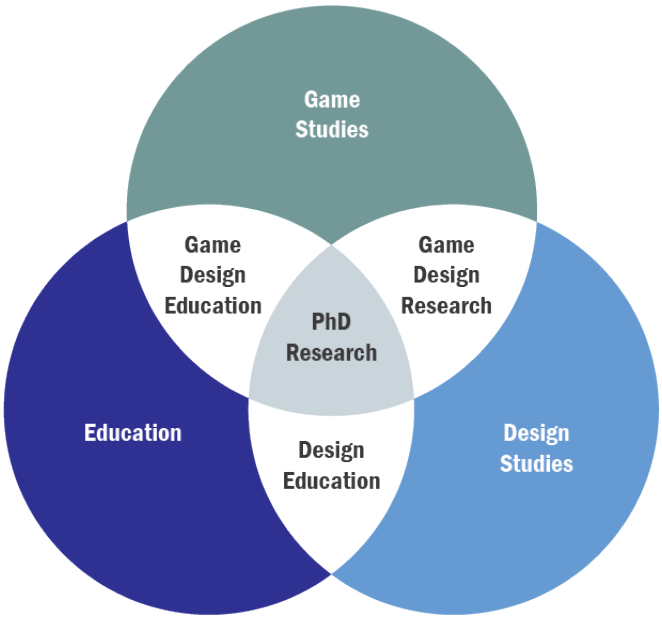


Figure 1.1 The research explores the overlapping areas of game studies, design studies and education.

design models, as this could help improve the methodologies and understanding of game design.

For example, Kuittinen and Holopainen (2009) reviewed design models compared to game design textbooks. They found that game design textbooks are often focused on the product of game design over the process of designing. Similarly to Kultima (2015), they suggest that looking at general models of design will "*not only allow for a better understanding of game design but also open up new possibilities of improving the methodologies of game design*" (p. 7). This potential to improve the game design process, particularly in the context of education, led to the design-based approach used in this research to make the tacit process of game design explicit and translate the learnings to the classroom context.

The primary domain of the research is within the field of game studies as it aims to enhance understanding of game design learning. Research within the field of game studies is a multidisciplinary endeavour that can involve a broad range of theories and methodologies across disciplines (Deterding, 2017; Gekker, 2021; Ouellette & Conway, 2021). Although

much of the research published in game studies relates to game design, at least in terms of keyword information (Melcer et al., 2015), it is often fragmented, making the study of the game design process a challenging undertaking.

The research conducted in this PhD follows the structure of a DRM Type 2 project that focuses on creating a comprehensive study of criteria related to research objectives (Blessing & Chakrabarti, 2009). Figure 1.2 outlines the stages of the research that were conducted. The project consists of three stages:

1. Research Clarification: This stage involves gathering data about the design situation under investigation. It includes a literature review related to game design, games education, and game design learning to develop research questions.

2. Descriptive Study: The descriptive study aims to gain a deeper understanding of game design learning. It examines the process from three perspectives: designer, educator, and student.

    (a) Designers: Interviews with game designers focus on their experiences and creative practices, resulting in a conceptual map of the design process.

    (b) Educators: Interviews with game design lecturers explored how game design learning is structured in higher education and aimed to identify commonalities and differences between perspectives.

    (c) Students: This phase of the study involved the observation of student game design learning during a six-week project, using fieldnotes and student development logs.

3. Prescriptive Study: The prescriptive study proposes a model of game design learning and supports to aid game design learning. The supports are discussed in the context of initial interventions and point to future work and potential benefits and limitations of the approach.

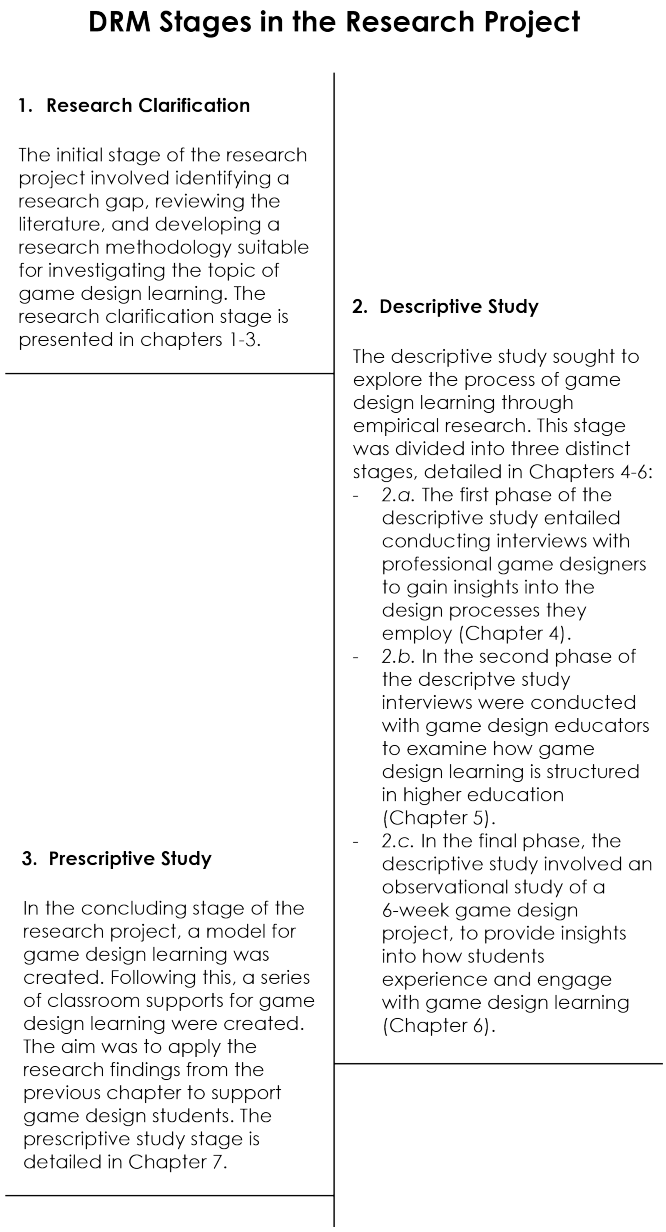


Figure 1.2 The DRM research approach applied in this PhD involves three stages with multiple phases of study taking part within the Descriptive Study

This PhD encompasses an exploration of game design learning through a structured approach that moves from understanding the situation to describing it comprehensively, and finally to proposing potential classroom supports. Further details of the methodology and DRM as an approach can be found in Chapter 3.

The following section will discuss the aims and objectives of the research project.

1.5 Aims and Objectives

The main aim of this research is to develop a better understanding of the game design learning process. The research is motivated and informed by my experience as a game designer and educator. The research also aims to develop a model of game design learning that can serve as a diagnostic tool to stimulate reflective practice among game design educators. The following research objective of this PhD serves as the foundation for the presented work:

> *To develop an understanding of game design learning in order to support students in the acquisition of game design expertise.*

The research takes a qualitative approach to develop a rich understanding of how game design learning occurs. To develop this understanding, several research questions (RQs) were created and answered throughout the research:

> *RQ 1: How do practising game designers describe the nature of their design process?*
>
> *RQ 2: How do educators structure game design learning in higher education?*
>
> *RQ 3: In what ways do students apply game design approaches within game development projects?*
>
> *RQ 4: How might a model of game design learning aid in the development of classroom supports for the acquisition of game design expertise?*

Table 1.1 below highlights the methods involved in answering each of the research questions investigated as part of this project. Chapter 3 (Methodology) outlines the rationale and approach for implementing this research approach. The development of the research questions is documented in Chapter 2 (Understanding Game Design). The following section describes the nature of the PhD contribution.

Table 1.1 Methods employed in answering each research question.

	Literature Review	Interviews	Observation
RQ 1: How do practising game designers describe the nature of their design process?	x	x	
RQ 2: How do educators structure game design learning in higher education?	x	x	
RQ 3: In what ways do students apply game design approaches within game development projects?	x		x
RQ 4: How might a model of game design learning aid in the development of classroom supports for the acquisition of game design expertise?			x

1.6 Research Contribution

This research project aims to improve our understanding of the game design learning process and to support students in the acquisition of game design expertise. The research took place within the context of higher education and through a design-based lens. This research seeks to directly provide an understanding of the game design process and game design learning. The research makes several significant, original contributions to knowledge (RCs) within the field of game design learning as follows.

RC 1: A model of game design learning.

The research develops a model of game design learning that extends upon those in related design disciplines, providing a deeper understanding of the game design process within higher education. This model aims to facilitate education, communication and shared understanding among game researchers, educators, and designers, ultimately enhancing the game design process and educational approaches to it.

RC 2: An account and interpretation of game design learning in higher education.

The research contributes to the understanding of game design learning through empirical, qualitative studies. By undertaking these studies, the research highlights the complexity of game design as a discipline and specifically the complexities within higher education. This adds to existing empirical studies on the game design process and offers unique perspectives from practising designers, educators, and students.

RC 3: Higher education classroom supports for game design learning.

Informed by the findings from the qualitative studies this research proposes a range of design supports that aim to address challenges within the game design classroom. The implementation of and reflection on these supports is discussed to share learnings with other educators. These design supports can potentially benefit educators by providing practical tools and methods to enhance the game design learning experience.

RC 4: Proposing the game development project as the signature pedagogy of game design learning.

The research suggests that the game project itself acts as the signature pedagogy of game design learning. This concept emphasises the central role of the game project in facilitating effective learning and skill development within game design education.

RC 5: An understanding of game design in relation to other design disciplines.

By examining the similarities and differences between game design and design in general, the research sheds light on the role of the game project in game design learning. Specifically, it highlights the multidisciplinary nature of game design and the centrality of implementation and iteration within the process.

Overall, the PhD research makes several contributions by developing a model of game design learning, conducting empirical studies, proposing design supports, exploring the signature pedagogy of game design learning and exploring the relationship between game design and other design disciplines. These contributions advance the understanding and practice of game design education, benefiting researchers, educators, and designers.

As outlined previously, this research was conducted through a design-based approach and is situated within the sub-disciplines of game design research and critical game design. As a result of this approach, the findings could also be of value to design researchers. Contributions 1, 2 and 5 (above) could be especially relevant to those interested in design processes in general and for researchers in fields such as interaction design, where design and technological complexity are at the core of the discipline.

In addition, game design as a discipline involves complex relationships that are highly multidisciplinary by nature and provide the opportunity to consider how designers interact across disciplines. While the research suggests that game designers follow processes similar to those employed by designers in other fields, it also highlights some of the unique aspects of games that are worthy of further attention. The following section provides an overview of the research outputs that form part of the contribution and inform the final thesis.

1.7 Dissemination

The research discussed in this thesis has resulted in the production of the following research outputs.

Book Chapters

Healy, J. P., & Cullen, C. (2023). If found... In K. Schrier, R. Kowert, D. Leonard, & T. Porkka-Kontturi (Eds.), *50 games to use for inclusion, equity, and justice.* Carnegie Mellon University: ETC Press.

Conference Papers

Healy, J. P., & Cullen, C. (2022a). Towards a model of the design process for games. *DiGRA 2022 - Proceedings of the 2022 DiGRA International Conference*.

Healy, J. P., & Cullen, C. (2022b). Navigating complexity: Investigating how students move through the game design process. *In FDG '22: Proceedings of the 17th International Conference on the Foundations of Digital Games (FDG '22)*. https://doi.org/https://doi.org/10.1145/3555858.3555905

Healy, J. P., Cullen, C., & Rooney, P. (2016). Towards a framework for computer-mediated debriefing in interactive game-based exhibits. *Irish conference on game-based learning*, 17–23.

Conference Presentations

Gannon, N., Healy, J. P., O'Reilly (Chair), G., & Williams, D. (2018). The gap between game development and education. *Dublin games summit 2018*.

Healy, J. P. (2016). Irish play culture. *The state of play: Game conference and festival 2016*.

Healy, J. P., & Cullen, C. (2022). Design heuristics as a pattern approach to idea generation. In *Gameplay design patterns approaches - DiGRA22 [workshop]*.

Healy, J. P., Cullen, C., & Rooney, P. (2016). Approaches to teamwork in game development education. *Picteilín 2016 creative media and game studies conference*.

Healy, J. P., Cullen, C., & Rooney, P. (2018). Debriefing in game-based learning. *The state of play: Game conference and festival 2018*.

Healy, J. P., Lim, B., & Cullen, C. (2019). Half professional, half real. *Irish conference on game based learning 2019*.

Conference Workshops

Healy, J. P., & Cullen, C. (2022a). Design research methodology (DRM) as an approach to study the game design process. *Proceedings of the Irish Conference on Game-Based Learning*.

Healy, J. P., & Cullen, C. (2022b). Game development projects in an academic context. In *Developing digital games in and for academic contexts - FDG22 [workshop]*.

1.8 Outline of the Thesis

This section outlines the structure of the thesis, the chapter titles and a brief description of their contents as follows:

Chapter 1: Introduction

This chapter introduces the research and provides background to the project and the role of the researcher. This chapter also discusses the research approach and contributions as well as the aims and objectives of the research.

Chapter 2: Understanding Game Design

This chapter outlines the relevant literature related to game design, education and design supports which informed the research approach and helped identify the research opportunity. The chapter looks at the game design process, game design education and game design research. The chapter concludes by outlining the research questions which emerged from the literature.

Chapter 3: Methodology

This chapter begins by presenting the theoretical perspective through which the research was carried out and then presents the qualitative methodology. Following this, it details the specific methods employed and describes the analysis process for each research phase. The

chapter concludes with a discussion of ethical considerations and the power relationships within the project.

Chapter 4: The Practice of Game Design

This chapter describes the first study, which sought to gain a deeper understanding of the design process and the expertise employed in the design of games. Through interviews with practising game designers, a theoretical framework was developed and used to discuss the research findings.

Chapter 5: Structuring Game Design Learning

This chapter investigates the game design process within an academic context and examines how game design educators structure the learning process within higher education. From the data analysis, a theoretical framework was developed to consider how educators structure game design learning and the framework was used to discuss the research findings.

Chapter 6: Experiencing Game Design Learning

This chapter describes a study of student learning in the context of game design education. The study involved a six-week game development project where students encountered and contended with real-world design problems. The processes used, and design modes employed by the students were identified through a grounded approach. This study is discussed through a theoretical framework that centres on the student learning experience.

Chapter 7: Supporting Game Design Learning

This chapter presents the game design learning model and a series of supports that were developed and implemented during the research. Each support was developed to improve the student learning experience and to encourage the acquisition of game design expertise and critical awareness. The chapter includes background, implementation, and reflection on each game design learning support.

Chapter 8: Conclusion

The final chapter of this thesis presents the conclusions of this research project. It discusses

the limitations of the approach and future work to expand our understanding of game design learning further.

1.9 Conclusion

This chapter outlined the research approach and provided contextual background to the PhD research. It also provided an overview of the research objectives, contributions, dissemination, and an overview of the thesis. The following chapter focuses on a review of the literature relevant to this research project and the perspectives explored within it.

Chapter 2

Understanding Game Design

This literature review presents an analysis of existing academic research on game design learning. The literature review leads to the development of a series of research questions that form the basis of the fieldwork phase of the research. The literature review in this chapter covers three primary topics:

1. *Game Design Practice:* This section focuses on the academic literature related to the game designer and game design process.

2. *Game Design Education:* This section first provides a review of key theories related to social constructionism and student-centred learning, followed by a review of educational approaches in game design.

3. *Game Design Research:* This section looks at approaches to conducting research into the game design process and then discusses design as a discipline in the context of this research.

By covering these areas of investigation, this review seeks to provide a foundation for the work carried out in this thesis and the contribution it makes to the study of game design education. The first section will provide a review of the literature related to the practice of game design.

2.1 Game Design Practice

The significance of games and play can be seen as a fundamental element of human culture and technological development (S. L. Brown, 2009; Huizinga, 1938; Riede et al., 2018). For most of history, games were played in person with physical pieces; however, with the advent of general-purpose computers after the Second World War computer games began to emerge as a new form of creative expression. Some of the first games were digital versions of traditional board games such as Xs and Os, draughts, and chess (Ivory, 2015). Within ten years of these developments, games such as Tennis for Two (Higinbotham, 1958) and Spacewar! (Russell et al., 1962) emerged as a new form of interactive, real-time entertainment. From these early technological demonstrations, the game industry emerged through arcade games such as Atari's Pong (1972) and Asteroids (1979) and the development of video game consoles such as the Magnavox Odyssey (1972) and the Atari Home Pong (1975), as well as commercial software for early personal computers. Since then, the games industry has become one of the largest entertainment industries globally, with annual revenue of over $214 billion in 2021 (PricewaterhouseCoopers, 2022). In addition to this, Keogh (2023) highlights a diverse field of game makers who are engaged in game development as a form of cultural production outside of the mainstream industry. This suggests that game design learning should also be conscious not only of the needs of large commercial developers but also of potential avenues for students to graduate into different forms of cultural production and creative practice.

While this thesis does not aim to add to the body of game definitions, it is important to ensure a consistent understanding of the terminology used and the reasons for doing so. Salen and Zimmerman (2004) define games as "*a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome*" (p. 80). This definition captures the breadth of games and serves as the definition used within the thesis. The term video game is also used throughout this thesis to refer to digital games. While Kerr

(2006) uses the term Digital Game as a broad term to include console, PC, arcade games, etc. this term does not reflect the vernacular among players, critics, or the industry who tend to primarily refer to video games (Belyaev & Belyaeva, 2019). For the purposes of this research, the term video game is used throughout to refer to all forms of digital games.

By nature of being part of the creative industries, game development is often interdisciplinary, heterogeneous, and diversified as opposed to a single coherent discipline (Hagen, 2011). The area of game development responsible for the creation of rules, the player experience and systems of play is called *game design*. Salen and Zimmerman (2004) define game design as "*the process by which a game designer creates a game to be encountered by a player, from which meaningful play emerges*" (p. 80). Potter (2002) notes that every human is a designer if we consider design as "*a blanket term to cover every situation in which adaptation of means to ends is preceded by an abstract of intent*" (p. 10). This suggests that in some respects all development team members are game designers. However, for the purposes of this research, the definition of designer focuses on those whose primary responsibility relates to game design. It includes those who create meaningful gameplay experiences for players. This role varies by the game studio and can include several sub-disciplines such as level design, user experience, system design, narrative design, mission design, economy design and technical design among others.

Video game development teams can range from individual artists, hobbyists and independent developers (indie) to large (AAA) studios that employ thousands of developers, with the primary platforms being mobile, console/handheld and PC. Within large studios, the process used in the development of games often varies. A number of studios use formal methodologies such as Rational Game Design (Jolis-Desautels, 2017), Cabals (Birdwell, 2006), Method (Cerny, 2002), and other approaches differing in terms of how prescriptive they are, the responsibilities of individuals, and the organisation of the project. In independent game development, less rigid design processes are often followed (Juul, 2019).

Additionally, researchers such as Young (2018) and Keogh (2023) highlight how *Gamemakers* design games outside of the mainstream and create their own methods and approaches to game design. Given the breadth of scales and variety of approaches described above, a singular understanding of game design is unlikely to be possible. However, the following sections aim to review the literature and provide an account of a variety of design processes.

2.1.1 The Game Design Process

The game design process is a relatively new subject of inquiry with the first books on the topic emerging in the 1980s (Crawford, 1984). As the discipline of game design has grown, so has the body of academic and professional literature related to game design. Many books and dedicated journals emerged in the early 2000s with Aarseth (2001) proposing that "*2001 can be seen as the Year One of Computer Game Studies as an emerging, viable, international, academic field*" with the launch of the Game Studies journal (www.gamestudies.org). Many game design books describe technical aspects or provide a high-level overview of the design process. This section will outline the literature related to the game design process.

Keogh (2019b) suggests that from the 1980s to the 2000s, video games underwent a process of *aggressive formalisation* driven by publishers and hardware manufacturers that regulated the release of games. This led to a distinction between professional and amateur developers in the eyes of consumers. In the 2010s, as digital distribution and online marketplaces began to provide an opportunity for amateur developers to gain visibility and commercial success, the indie game development movement began to gain traction (Juul, 2019; McCrea, 2013). Developers outside the mainstream industry often follow fewer formal processes and have developed more diverse and individualised games than in the larger AAA industry (Ruberg, 2020; Young, 2018). Keogh (2019b) has described the current state of game development processes as one where there is a mixing of both the informal approaches

of indies and the formal approaches of AAA studios to development. To describe this mixing of processes and approaches between indie and AAA developers Keogh coined the term *intense in/formalisation* (2019b). Even in the context of these more flexible approaches to game development, an overarching process is evident in much of the literature, which broadly provides an overview of the development of a game from idea to release.

The game design process often proceeds from ideation to pre-production, to production, and post-production (Berg Marklund et al., 2019; Fullerton, 2019; Lemarchand, 2021). Throughout this process, there is constant iteration, with new ideas and concepts being generated, tested through prototypes, and evaluated through player feedback (Fullerton, 2019). Berg Marklund et al. (2019) highlight the nature of the game design process as being non-linear as ideas evolve and emerge through the development and testing process. This is echoed in numerous textbooks highlighting the importance of iteration in the development of video games (Fullerton, 2019; Macklin & Sharp, 2016; Salen & Zimmerman, 2004).

Novak (2022) describes the production stages as concept, preproduction, prototype, production, alpha, beta, gold, and postproduction (p. 380). Berg Marklund et al. (2019) found that game development broadly falls into four phases: ideation, preproduction, production, and post-production. The first phase, ideation, involves the development of game concepts that may be suitable to develop further. Once the game concept has been developed, it is necessary to test it to see if it achieves the desired gameplay goals through a prototyping phase. As prototypes become more formalised, the game moves into production, where there is a clearer understanding of what the game will be. Post-production has emerged as a significant factor in game development over the last number of years as games receive bug fixes, feature updates, expansions and additional content, sometimes years after the original release. Lemarchand (2021) provides a detailed account of the phases of development (See Figure 2.1) from his experience within the AAA game industry that closely aligns with the findings of Berg Marklund et al. (2019) from their literature review.

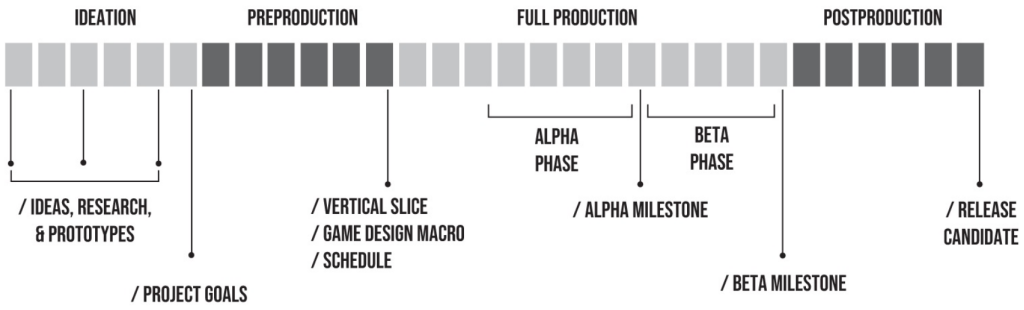


Figure 2.1 Lemarchand (2021, p. 18) describes game development as being split between ideation, preproduction, full production, and postproduction.

Within the AAA game industry, the *Method* approach developed by Mark Cerny and Michael John (Cerny, 2002) proposed a model of game development split between two phases: preproduction and production which has influenced the development process at many large/AAA developers (Ivan, 2020). The preproduction phase is described as *managing chaos* by Cerny where the macro design of the overall game, an approximately 5-page document, is the outcome of this initial experimentation phase. Following this phase, the game moves to full production where a larger team work to create the final game.

The *Rational Design Method* (RDM) developed by the large publisher and developer Ubisoft (www.ubisoft.com) utilises a data-driven approach to quantify user experience and create gameplay to suit player needs (Jolis-Desautels, 2017). This approach focuses on the use of metrics and data analysis in terms of identifying the aspects of player experience and, through evaluation by the designer, suggests potential solutions to design problems. The *Cabal* process operated by Valve Inc. (www.valvesoftware.com) describes a democratised process of design and development focused on the use of specialised groups or *cabals* within the larger studio organisation (Birdwell, 2006). These cabals develop solutions by working in specialised teams that use an internal design process supplemented by regular feedback from players.

Cohendet and Simon (2007) highlight how a large studio approves the development of a proof of concept based on an idea. This proof-of-concept is then developed before the



Figure 2.2 The three stages of game development from Adams (2010, p. 45) show how a project moves from concept to elaboration and finally to tuning stages.

concept is ready for preproduction to begin on the project. During this preproduction phase, the game concepts and ideas are refined further before entering a more formal and strictly controlled production phase. Once the game concept has been developed it is then time to test it to see if it achieves the desired gameplay goals through a prototyping phase. As prototypes become more formalised the game moves into production where there is a clearer understanding of what the game will be.

Adams (2010) describes the game design process as split into three stages: concept stage, elaboration stage and tuning stage (See Figure 2.2), with constant prototyping, playtesting and iteration throughout these phases. The *concept phase* as described by Adams involves generating the initial ideas for the game that the team will then develop further during the elaboration stage. In the *elaboration stage*, the developers move from the concept to developing prototypes and eventually move to full production. Finally, the *tuning stage* is where the major design decisions have been made and variables, levels, and mechanics are adjusted to achieve the desired gameplay experience. The stages described by Adams (2010) differ from the pre-production/production models described above as he proposes a difference between the design process and the game production process. The concept phase and the initial prototyping of the elaboration phase take place before the publisher or funder gives the approval to move to full production.

Lemarchand (2021) highlights the significance of the ideation phase within the development process within his model of the phases of game development (See Figure 2.1). Within this model, ideation takes a similar timeframe as preproduction and when combined these exploratory aspects of game development take a similar total time as that spent in full production. Lemarchand (2021) highlights the emerging importance of ideation to the design process:

> *As time passed, we learned in stages, first figuring out the importance of preproduction and its differences from full production, then realizing the importance of postproduction. Finally, we recognized that we were missing out on the very first step: we had something to learn from the ideation processes used in games academia and in other mature design disciplines.*
>
> (p. 18)

However, Adams (2010) suggests that while the concept phase should only take a "*few weeks; the preproduction phase of development can go on for several months*" (p. 46). A long preproduction phase first gained prominence based on the work of Mark Cerny and Michael John (Cerny, 2002). This suggests that preproduction times can vary considerably depending on the nature of the project and the design process employed in the development of the game. In many always online games and games as a service, the ideation process continues into post-production with games receiving bug fixes, feature updates, expansions and additional content sometimes years after the original release (Lemarchand, 2021).

One method that has been proposed to manage the game development process is *Agile*. Agile methodology is a project management and software development approach that was developed in response to the limitations associated with traditional Waterfall methodologies. The *Agile Manifesto* (Beck et al., 2001) describes the process as follows:

> *We are uncovering better ways of developing software by doing it and helping others do it. Through this work we have come to value:*
>
> - ***Individuals and interactions*** | *over processes and tools*

- ***Working software*** | *over comprehensive documentation*
- ***Customer collaboration*** | *over contract negotiation*
- ***Responding to change*** | *over following a plan*

While there is value in the items on the right, we value the items on the left more. *(p. 1)*

The method is popular within game production processes as outlined by Keith (2020). The application of Agile methodology in game development has a number of potential benefits. As outlined by Keith (2020) the primary benefit of applying Agile is the ability to achieve higher quality outcomes at lower cost through the application of Agile development practices. However, McKenzie et al. (2021) suggest that developers need training to apply agile methodologies within game development projects and that communication and the multidisciplinary nature of game development teams may present challenges.

Manker (2012) highlights communication as important for game design due to the complexity of the discipline. However, documentation presents a challenge in game design due to the chaotic nature of game development (Tschang & Szczypula, 2006). To address this, Fullerton (2019) suggests novice designers pick their top three game ideas and write a concise, one-page concept document for each to be tested with potential players. Adams (2010) recommends crafting a 2-4 page high-concept document that can be read in 10 minutes or less once a game idea is established. Sellers (2017) describes a similar concept document with sections such as working title, concept statement, genre(s), target audience, and unique selling points. Adams (2010) and Sellers (2017) both emphasise the importance of crafting a succinct concept statement of 1-3 sentences that captures the important aspects of the game. Sellers suggests considering it to be broadly the length of a tweet, "*in 140 characters or less, describe everything that is important about your game*" (2017, p. 195).

Designers in other fields often begin their creative processes with visual representations of their ideas, such as quick drawings or sketches (Landay & Myers, 2001; Suwa et al., 1998; Tversky et al., 2003). In the field of *Human-Computer Interaction* (HCI), Sturdee

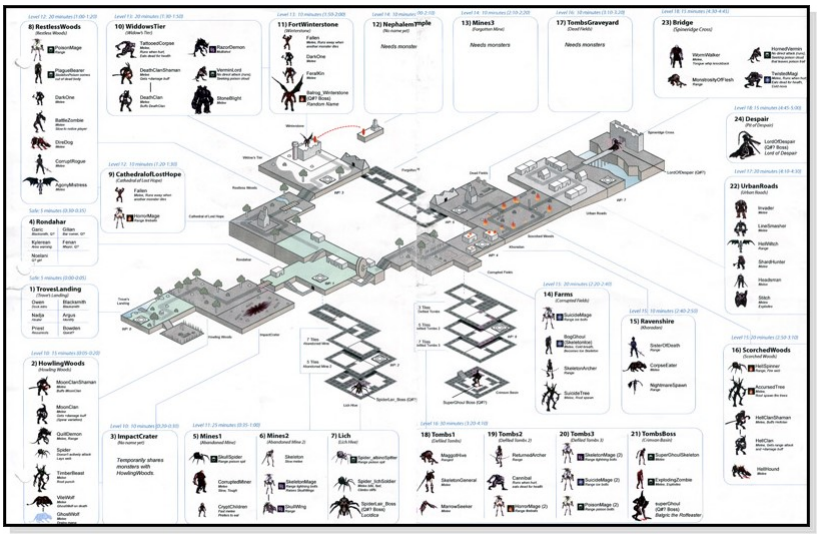


Figure 2.3 A sample one-page design document for a role-playing game by Librande (2010, p. 26) provides an alternative to linear documentation.

and Lindley (2019) describe sketching as "*speculative, a piece of human imagination, or subjective view of the world with the potential for re-interpretation*" (p. 2). However, as discussed above, according to the literature game designers tend to rely more heavily on written documentation instead of sketches. Game designer Stone Librande (2010) proposes one-page game designs as a visual design document, an example of which is illustrated by Figure 2.3. This schematic format displays encounters, enemy types, and other important gameplay information. The document provides a comprehensive overview of the proposed design and facilitates discourse surrounding the design among the team.

Librande (2010) also suggests storyboarding as a means of communicating game concepts on a single page (see Figure 2.4). The storyboard serves as a single-page design document to communicate sequences of gameplay. Maani (2014) developed an e-Learning framework to support storyboarding skills among game design students, with the potential to enhance student design communication. Hagen (2012) describes the breadth of concept documentation for games as *Lodestars* that are "*supposed to help game developers navigate the design space and reach their goal*" (p. 63). Hagen asserts that for Lodestars to be effective, they must embody seven functions: externalising the vision, communicating the vision, inspiring,

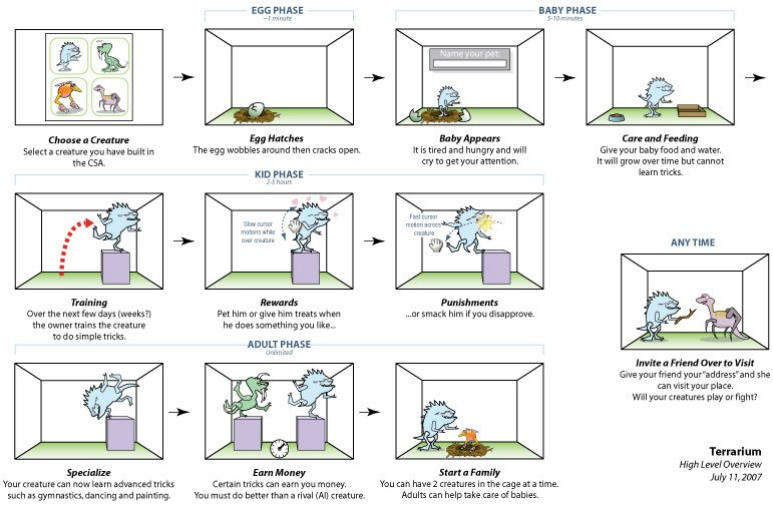


Figure 2.4 A sample game design storyboard by Librande (2010, p. 50) suggests further alternatives for game design documentation.

unifying, guiding, and promoting team building and self-motivation. These approaches suggest the potential for investigating communication in game design beyond the written approaches typically advocated in textbooks.

In addition to structured documentation, there are approaches where designers may opt to directly enter development (Young, 2018) by creating interactive game prototypes. Manker (2012) highlights the need for designers to be able to communicate ideas to the team, often through prototypes. As he notes, "*communication around game design problems need to include as much of the idea of the game ... as possible* " (p. 4). Prototypes can take the form of digital or paper prototypes or animations to communicate the game concept. Sid Meier, the well-known game designer, describes writing design documentation before developing a prototype as "like drawing a map before you've visited the terrain" (2020, p. 130). This suggests that for some designers documentation may not be important to their process and instead a prototype can serve the role of sketches or documentation by providing clarity around the game concept.

The *playtest* (or play test) is a way for designers to evaluate their game designs and involves players testing versions of the game while in development to get feedback. The

method involves a combination of surveys and gameplay to provide game designers with "*actionable feedback from consumers about how they perceive critical aspects of their games*" (J. P. Davis et al., 2005). Kasurinen et al. (2013) found that the use of playtesting as a method for external feedback was more evident among professional designers when compared to student teams. J.-W. Liu et al. (2019) analysed feedback practices in ten major developers based in Taiwan. The researchers found that both feedback specificity and iterative feedback during development had a positive relationship with the game quality. Fullerton (2019) advocates for regular testing of games throughout development and includes testing game concepts on potential players. Salen and Zimmerman (2004) describe the entire development of a game as a *play-based design process* (p. 11) where games are prototyped and playtested in a regular iterative cycle. Adams advocates for a similar approach called the *player-centric approach*(2010), while Lemarchand (2021) describes the *playful production process* as a combination of his experience within the AAA industry and his time teaching with Tracy Fullerton.

Research as an aspect of the game design process may be underrepresented in the literature when compared to other design disciplines. Many textbooks focus on idea generation over research and exploration. Lemarchand (2021) however emphasises the importance of research in the early design process and includes insights into how research informed the design of the Uncharted series:

> *Research is one of my favourite parts of the ideation phase, and it was important in the creation of every Uncharted game. We wanted to root our stories in historical and geographic fact, because we knew that "grounding" them in this way would help our audience suspend their disbelief.*
>
> (p. 30)

This might suggest that the literature doesn't effectively capture the types of research conducted during the game design process. Clara Fernández-Vara outlines a structured approach to analysing games in *Introduction to Game Analysis* (2019). In her book,

Fernández-Vara divides game analysis into three areas: the context, the game overview and the formal elements. The context of game analysis encompasses how the game was developed, and played, and the communities and materials around the game. The game overview is the content and features that distinguish it from other games as well as how it has been received and adapted by audiences. Finally, the formal elements describe the components of the game and the representation to the player.

In addition to the processes discussed above, Whitson (2020) highlights how accounts of the development process often cover up the more *messy* reality experienced by developers. This work highlights the importance of soft skills in game development as developers consider skill-building for "*problem-solving, social coordination, and interacting within complex human-machine assemblages*" (Whitson, 2020, p. 285). Schon (1979) describes *tacit knowledge*as a process where designers find it difficult to externalise their design knowledge. The concept of tacit knowledge in design is echoed by Cross (2006), who highlights the importance of externalising this knowledge: "*What designers know about their own problem-solving processes remains largely tacit knowledge — i.e. they know it in the same way that a skilled person 'knows' how to perform that skill*" (p. 24). This suggests that the picture of the design process in the literature may not fully account for the messy and tacit aspects of the game design process.

The literature reviewed in this section highlights the wide range of methodologies employed in the industry, resulting in a lack of uniformity across studios and game makers. This lack of consistency across studios and creators presents a challenge to researchers seeking to understand the process and educators tasked with training future generations of game designers. The literature presented in this section illustrates a diversity of development approaches within the game industry and independent practice. The sources however suggest that while development processes often differ at the macro scale they tend to move from

more open-ended design spaces (ideation, concept, prototyping, and preproduction) to more constrained design spaces (elaboration, tuning, full production, and postproduction).

This section has provided insight into the macro process of game development and how the role of the designer can evolve throughout a game project. By analysing the design process and developing a shared understanding of it, academics and researchers may be better able to educate and understand the role of the designer within the process. In particular, the design process provides context for game design learning as the process prepares students for professionalised ways of working. Educators need to be aware of the various methods that may be applicable to different games/teams/situations and should be cognisant of which approaches are best suited to their classroom context. It also suggests that further research into the game design process itself could arguably benefit educators in their selection of teaching approaches. The following section will build on this understanding of the process and consider the role of innovation within the game industry.

2.1.2 Innovation in the Game Industry

The market for video games is one where "*novelty, innovation and originality are crucial*" (Lê et al., 2013, p. 59) and games are often considered to be highly innovative products (O'Hagan & O'Connor, 2015). Innovation within the game industry and the wider creative industries is an important aspect of production. Innovation in the development of video games can come from multiple sources, such as technical breakthroughs, individual creativity, users, and the market (Granados et al., 2017; Lê et al., 2013). Traditional models of innovation focus on research and development activities (R&D) where research is situated within the physical/biological sciences, and development is the application of this research to novel technologies (B. Godin, 2008). This is often described as *Technological Product and Process Innovation* (TPP). The Organisation for Economic Co-operation and Development and Eurostat (2018) provide the following definition of innovation:

> *An innovation is a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process).*
>
> (p. 20)

Several authors have proposed that this definition of innovation fails to effectively capture the activities of the creative industries (Jaaniste, 2009; Stoneman, 2011). An alternative approach called *Cultural Product and Process Innovation* (CPP) is concerned with "*the research, development, application and diffusion of cultural products (stylistic changes, changes to forms, changes to content) and their processes (the ways in which products are made, delivered and distributed)*" (Jaaniste, 2009, p. 226). Similarly, Stoneman (2011) proposed a new definition for innovation within the creative and cultural industries called *Soft Innovation*: "*Soft innovation is innovation in goods and services that primarily impacts upon aesthetic or intellectual appeal rather than functional performance*" (2011, p. 22).

The concept of soft innovation in video games, for example, suggests that much of the innovation within games is related to the aesthetic appeal of the game (i.e. the appeal to the senses) as opposed to functional or technical improvements. Jónasdóttir (2018) suggests that soft innovation in the games industry is "*associated with shaping the experience of the users through new creative content and/or aesthetic design providing more pleasant, sophisticated, or simplified interactions and symbolic content*" (p. 35). Ettlie et al. (1984) categorise innovation as being either radical, containing a high degree of new knowledge, or incremental, having a low degree of new knowledge. Within games research, Storz et al. (2015) highlight that the game industry is primarily focused on incremental innovation by citing the decline in the creation of new game genres since the 1990s.

One of the critiques of the concept of soft innovation is that it places commercial success as a key metric for measuring innovation (Eltham, 2013). However, even within the space of smaller indie game developers, there is a desire to achieve commercial success to continue and grow the ability to release games (Guevara-Villalobos, 2011). Johnson and Sullivan (2018)

conducted interviews with several game studios and found that this tension between the desire to achieve market success and artistic vision can lead to a level of anxiety and uncertainty during the development of games. This suggests that the concept of soft innovation and its connection to commercial success is arguably a beneficial method for understanding innovation within the game industry.

By analysing a dataset of 1,800 observations on a variety of games and platforms Cox (2014) found that "*as quality is found to be one of the most important factors affecting the likelihood of a video game becoming a blockbuster, optimisation of the gameplay experience would seem to have considerably more impact on sales than, say, paying for a license or franchise endorsement*" (p. 197). Cox uses quality as a term to describe the overall gameplay experience of the player and not just the technical implementation. This finding is in line with other industries where innovation has been seen as linked to commercial success (Shapiro, 2006).

This section has discussed the role of innovation within the game development process and the importance of soft innovation in particular within games. As many designers seek to develop games that are viewed as innovative the concept of soft innovation may be beneficial to consider how this drive for innovation is reflected within the design process. It also suggests that educators should be aware of the role of soft innovation and consider how it might be employed within the context of game design learning to encourage students to produce novel work. The following section explores the role of creativity in the design of video games and our understanding of creativity within the game design process.

2.1.3 Creativity in Game Design

Runco and Jaeger (2012) describe creativity as requiring both originality and effectiveness in their *standard definition of creativity*. Originality, or novelty, is required for something to be considered creative as otherwise, it would be common and lacking in creative aspects.

Something that is original or unique but lacks utility or value would not be described as original as it "*must be balanced with fit and appropriateness* " (Runco, 1988, p. 4). Tschang and Szczypula (2006) describe video games as "*composed of ideas generated by individuals' creative processes*" (p. 275). This highlights the importance of creativity and the ability to generate ideas for the work of game designers. Many design models treat ideation as a single step where ideas are produced in one session. These ideas are then evaluated, and one is selected to pursue (Daly et al., 2019; Hsiao et al., 2017); however, others see it as a continuous, iterative process (Goldschmidt, 2016; Shah et al., 2000). As design opportunities occur throughout the highly iterative nature of many game development projects (Berg Marklund et al., 2019), the role of ideation and creativity is arguably significant in game development far beyond the initial phases of the project.

Creative cognition is the approach to creativity research focused on understanding the process and structures that lead to creative behaviours and outcomes. The approach proposes that "*ideas and tangible products that are novel and useful are assumed to emerge from the application of ordinary, fundamental cognitive processes to existing knowledge structures*" (Ward, 2007, p. 28) instead of being only the realm of expert practitioners and geniuses. Numerous design theorists have also explored the relationship between the activity of design and creative cognition (Cross, 2002; L. Liu et al., 2017; Visser, 2006). The *Geneplore Model* (generate and explore) proposed by Finke et al. (1992) suggests that creativity alternates between a preinventive phase (idea generation) and a phase of exploration and interpretation where ideas are considered and evaluated within the context of wider product constraints. These approaches suggest that creativity can be developed through deliberate practice.

Hagen (2012) found that "*video game design seems to be moving from engineering to artistic creation and from a division between design and construction to a more creative non-rational way to work with interplay between ideation and fabrication*" (p. 89). In the game design process, the relationship between the game idea and the technical feasibility

creates a trade-off between what is possible and the creative vision (Wang & Nordmark, 2015). While Wang and Nordmark point out that the creative team can request changes to a game throughout development, this decision depends on how advanced production has become, typically a cost/benefit analysis at that point. This means that new ideas are often easy to implement through rapid prototyping early in a project but become more difficult as a game project approaches release.

The interplay between technological and creative considerations in the development of video games creates constraints for designers who must adapt concepts to new hardware or engines and develop games to use the potential offered by these technological advancements (Lê et al., 2013). Technology acts as a medium between ideas and their implementation within the game, and it "*allows a creative game designer to express and share ideas*" (Lê et al., 2013, p. 55). Within indie game development, Juul proposes *anti-inspiration* as the way in which indie developers seek to break the conventions of the game industry (2016). This is a form of self-imposed constraint that the designers place on their own design process. This interplay between creativity and constraints is similar to the product constraints outlined by Finke et al. (1992), which is part of the creative process as opposed to an obstacle to creativity in itself. The constraints act to limit the possibility space of the game designer while also outlining the nature of the design space.

Ho et al. (2015) suggest that "*no designs or design ideas are wholly original, which is to say they must have an origin of inspiration*" (p. 37). In their analysis of the 2014 Global Game Jam, Ho et al. (2015) found that inspirations served as a network between ideas and that the theme of the game jam often helped to focus inspiration sources. Game design inspiration can come from a variety of sources (Hagen, 2009). The work of Hagen showed that within a study of 25 games, all titles combined a *recycled part* and an *innovative part*. Hagen proposed a model (See Figure 2.5) for this form of game innovation based on his research. This model shows how there can be elements of both radical and incremental

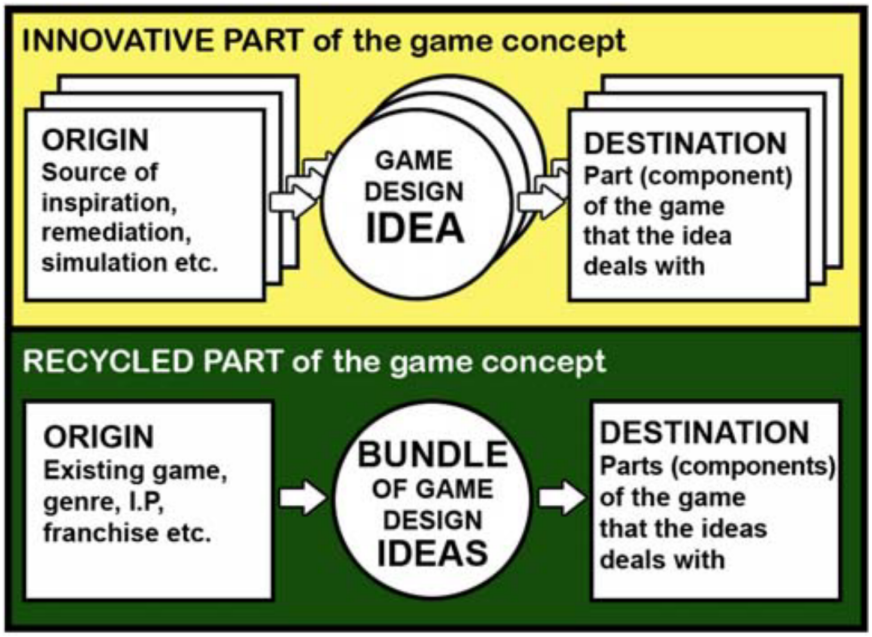


Figure 2.5 The game design concept model by Hagen (2009, p. 4) highlights the nature of game concepts as including both innovative and recycled elements.

innovation within a single game concept as games may innovate across aspects of the game concept.

Another model of the creative process in the preproduction of video games focused on the types of creativity observed was proposed by Sánchez et al. (2021). This model (See Figure 2.6) suggests creativity in the design of games can come from a mash-up of different sources, exploration of accepted structures and rules and transformation of existing approaches and norms. Designers often employ these different approaches depending on the types of challenges they face. Using these examples designers may employ sources of inspiration as a factor in their design process to draw on prior work to help shape the design space for their game. Ho and Carter (2019) describe these as networks of inspiration where games where related concepts can transfer between games and create networks of shared design elements.

Within game design, ideas are often seen as a starting point by designers that are subject to change to meet the needs of the game. As Kultima writes "*ideas are prone to be altered in*

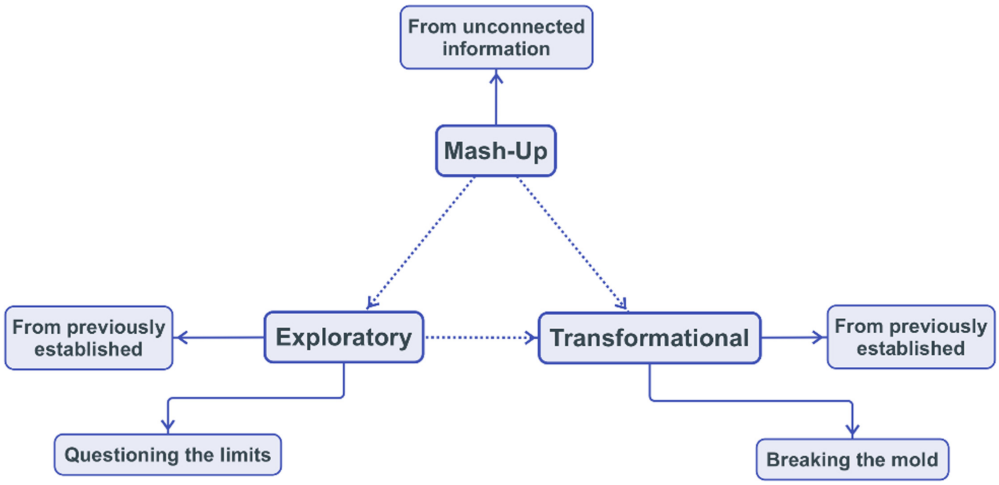


Figure 2.6 The game design concept model by Sánchez et al. (2021, p. 207) describes game concepts as arising from three different processes; mash-up, transformational and exploratory.

one way or another during the design process" (2010, p. 4). When designers spoke of game ideas in Kultima's study, they found it easy to develop new ideas but were challenged when developing "*good ideas*" and even found it difficult to describe the qualities of good ideas. For the interviewees in Kultima's study, the aspect that signified good ideas was how others received them. They are described as "*inspiring for others to immediately build on top of them*" (p. 4).

Berg Marklund et al. (2019) reviewed 48 empirical studies on game development and found that the majority of them dealt with the concept of creativity. They found that the inspiration for ideas, how ideas are transformed, technological innovation, bugs and the interplay between collaborators affected the development of the project leading to the conclusion that the "*game development process is nonlinear, whereby ideas evolve during the development and test process*" (p. 186). In this meta-review, they found "*that creativity is achieved through a collaborative, test-driven process where structure, documentation and control are de-emphasized*" (p. 187).

The relationship between the idea for a game and the mechanical/thematic elements is also closely related to the prototyping process. Manker (2012) highlights the importance of having

a technical implementation of the game in the form of a prototype to communicate game ideas to the wider team. Within game development, designers view "*prototypes as sketches, visualizations, communication of a function, tests of a function, design aids, specified parts of an intended outcome and an experience of an idea*" (Manker, 2011, p. 2). Hagen (2011) describes this process as a negotiation between the designer and themselves and the designer and the development team.

The importance of creativity in game design and approaches to it have been illustrated in this section. Within game development, there is a demand for novel ideas and designers have a significant role in the generation of these. The constraints placed on the creative process create a design space within which the designers can act and serves to prompt effective idea generation. This creativity within the game design process can be seen as the interplay between existing ideas, new ideas and explorations of these to find original design directions. For game design educators this suggests the potential for design supports that target idea generation and encourage the generation of novel game concepts.

From the review of the literature on game design practice a number of key factors have been uncovered:

- The game design process is highly heterogeneous with practices varying across different developers and teams. There is no singular design process in terms of steps or stages that game projects move through. However, most projects will have elements of preproduction early in development and at some point move towards full production.
- Innovation within the game industry is an important factor for both large and small developers as they seek to design games that will capture players' attention. Innovation in game design often relies on innovative content, genres, visual design, and player experience. These can be seen as forms of soft innovation.
- Game designers aim to generate novel ideas and often borrow or transform concepts from other games/media/experiences/etc. The literature suggests that game designers

move from more open design spaces to more constrained spaces during the development process. The constraints are both external and self-imposed and in addition to limiting the design space they also can lead to creative opportunities.

While this provides insight into the game design process there is a lack of literature related to how designers work within the process. This results in a lack of understanding in relation to how designers experience the process and the modes of designing they employ within it. This led to the formulation of the first research question:

> *RQ 1: How do practising game designers describe the nature of their design process?*

By gathering first-hand empirical accounts of the design process this research seeks to uncover new insights into the nature of game design. These insights will inform the design of educational supports for use in game design learning. The following section will discuss game design education and review existing literature related to game design learning.

2.2 Game Design Education

The discipline of games education is relatively new in academic terms; one of the first third-level programmes was launched in 1993 at DigiPen Applied Computer Graphics School (www.digipen.edu) in Washington State (Wolf & Perron, 2003). Since then game design, art, and development programmes have become commonplace at many higher education institutions (Tunnel & Norbisrath, 2023). In 2008 the International Game Developers Association (IGDA) developed a curriculum framework to support institutes developing programmes in the discipline. The framework outlines game design as one of the nine topic areas and describes the importance and challenges of game design education as follows:

> *This is the Core Topic most intrinsic to games themselves and is therefore in some ways the heart of the curriculum framework we outline here. On the other*

> *hand, because it is the least understood, trained instructors and quality reference materials are sorely lacking, making it among the most challenging Core Topics to teach.*
>
> (2008, p. 12)

While much has changed in the intervening years, there remains significant scope to improve our understanding of how game design is and could be taught. Game design is a complex process that requires understanding numerous aspects of game development; teaching these concepts can be a complex task. Larsen (2018) highlights the challenges of teaching game design and the issues with using a textbook approach due to the complex and messy nature of the process. Similarly, Whitson (2020) highlights the complexities of teamwork and the importance of soft skills in terms of game development, while Khaled et al. (2018) show how complex the design space can be for digital games. Eric Zimmerman suggests that practice is a core element of game design education:

> *Game design is not about making games – about shipping finished products. It is more like a martial art or learning a musical instrument: a practice where we learn over time by taking on challenging problems. That's what I believe. And that's how I teach game design.*
>
> (2013)

The practice of game design outlined by Zimmerman above often takes place within the context of game development projects. The following section outlines the literature related to teaching game development in higher education.

2.2.1 Game Development in Higher Education

Within higher education Czauderna (2018) suggests that many programmes focus "*on the interdisciplinary and collaborative design and development of digital games as well as a reflection of their wider aesthetic, historical and cultural contexts and implications*" (p. 12). Tunnel and Norbisrath (2023) reviewed 113 European bachelor curricula in video games to

gain insight into how education within the field is structured. They found that programmes focusing on game art or programming tended to be specialised, whereas game design was often more interdisciplinary in nature.

McGill (2012) studied the curriculum planning process for game degrees in the UK and US. Her research identifies program motivation, internal and external influencing factors, and program content. The influencing factors considered during curriculum planning are categorized as external and internal, and they encompass a wide array of elements, ranging from industry needs to learner factors. Deliberation plays a central role in the process, and it involves making informed decisions about program content, including learning outcomes, assessment, instruction, requirements, and structure. After implementation, the program continually evolves based on feedback from various stakeholders, assessments, and organizational impacts.

Keogh and Hardwick analysed 119 game development programmes in Australia to understand their disciplinary perspectives. They found that:

> *... while game development HE education is consistently positioned as a pathway towards employability in the videogame industry through targeting prospective students' existing consumerist gamer identities, just what skills and capacities programs emphasise as crucial for such employability varies pending on the program's institutional context as a HASS, STEM, or exclusively Games department. Ultimately we argue that rather than simply marrying STEM and HASS, game development HE instead seems torn between different disciplinary cultures, ideologies, and aims.*
>
> (2023, p. 2)

This suggests that the relatively new discipline of game development education is still developing, however, the literature suggests common elements across programmes. Many educators use project-based work to teach game design topics in higher education (Johnson & Sullivan, 2018; Kasurinen et al., 2013), with the educator often taking on the role of mentor throughout the project (Nash & Shaffer, 2013) and adopting elements of studio-based

learning (Estey et al., 2010). Zagal and Sharp conducted a survey on capstone courses on game programmes and found that many are designed for students to:

> 1. *practice and learn "soft skills" such as communication, collaboration, and team work,*
> 2. *create a portfolio-quality project,*
> 3. *have an "authentic" industry-like work experience, and*
> 4. *exercise some independence*
>
> (2011, p. 4)

They found that the objectives of the game development project in higher education and that the success of such projects are often contingent on the overall structure of the programme. Many programmes emphasise elements of industry practice within the curriculum to prepare students for their careers after graduation. Ashton (2009) outlines how higher education institutions typically focus on equipping students with industry-specific skills to prepare them for successful careers in the game industry.

Wang and Wu (2009) explored the application of a game development framework in higher education. Their study looks at the practical integration of a game development framework within the computer science classroom, emphasizing its potential to enhance learning experiences for students. The research focuses on hands-on learning and the practical application of game development principles in order to support the development of software development competencies among computer science students. The authors highlight how the implementation of a game development framework led to positive student evaluations and learning outcomes. The study, however, also highlighted the challenges of supporting game engines within the classroom and the specific requirements of game development.

Harvey (2019) highlights the approaches these programmes take in order to ensure students are ready for the workforce: "*from industry speakers in the classroom to organized game jams, trips to conferences, and assessment activities specifically oriented toward a particular console, software, or engine (where programs have sponsorship deals with*

companies)" (p. 760). Hurford et al. (2020) outline how they structure a game development project aligned to industry structures and approaches. In this example, the students work with a local indie studio that sets a brief for the project along with the lecturing team. This shows how many programmes aim to develop students for the game industry through simulation and the acquisition of professional skills. However, this learning mode can only "*replicate slices of a typical weekly working pattern*" (p. 35) due to the constraints of an academic environment.

A number of authors have published research exploring the gap between industry needs and academic provision (Giri & Stolterman, 2022; Ip, 2012; McGill, 2009; Tunnel & Norbisrath, 2022). McGill (2010) surveyed academics and industry to explore the gap between education and practice across four areas: Knowledge Areas, Technical Skills, Abilities and Contextual Fluency. The survey was focused on development (technical) positions but found that academia was effectively preparing students for entry into the game industry. Ip (2012) suggests that the gap between industry and academia may be due to a focus on more general educational aims within higher education. In addition to the gap between education and industry Giri and Stolterman (2022) highlight the challenge of shifting student identities from players to designers of games. They also suggest that a challenge for game design education is the lack of specific tools to teach game design. The above accounts suggest that even with a clear connection between industry and academic practice gaps are likely to exist between industry expectations and the nature of higher education.

The focus on technical skills has implications for how educators approach teaching game design, as Keogh writes "*the notion that making videogames was itself a creative practice and not simply a repertoire of technical skills was difficult to convey to some students*" (2023, p. 104). Keogh (2019a) argues that this should not be the primary goal of tertiary education in game development. According to Keogh, game education can be seen "*as sitting on a three-point spectrum between training 1) employees to enter an industry, 2)*

entrepreneurs to start their own business, and 3) artists to develop their own cultural identity" (p. 1). From interviews with game developers, Keogh found that while all three approaches were beneficial, many developers viewed the *artistic* approach as the most valuable as they perceived the work as being creatively focused.

Ashton (2009) emphasises the difficulties of this intimate orientation to the game industry as it can confine the *imaginaries* that students contemplate when devising new game concepts. Harvey (2019) describes how the focus on risk management and individual concerns within the structure of higher education can present challenges to students focusing on the creative/artistic aspects of the discipline:

> *At a brainstorming session with industry and HEI representatives, experienced game designers complained of seeing unoriginal, uncreative portfolios from recent graduates and urged instructors to encourage students to "take risks" in their gameswork. But between hefty tuition fees, frequent warnings of an oversaturated market of graduates, and horror stories about the difficulty of securing employment in the industry, it is unsurprising that students are reluctant to break with the traditions they see in gameswork and repeat familiar discourses and ideas as they prepare to enter the industry. [...] The major challenge is that risk management is predominantly focused on managing one's progress through the pipeline such that other areas which may benefit from creativity, innovation, and passion, such as fostering greater inclusivity or challenging punishing work norms, are not seen as essential or even possible.*
>
> (p. 762)

To address this Johnson and Sullivan (2018) describe a pilot project to facilitate exploration and creativity in undergraduate game programmes. They propose that modifying the project grading structure to allow creativity and experimentation may reduce student anxiety over failure. While Sullivan and Johnson also suggest rapid prototyping and frequent feedback as pedagogical interventions, numerous other authors have described these as part of the structure of game projects within higher education (Czauderna, 2018; Harvey, 2019; Zagal & Sharp, 2011).

The social constructivist approach of Vygotsky (1978) highlights the importance of collaboration and social interaction in the generation of knowledge. Given a trend toward

group work in higher education, several authors, such as Davies (2009) and Gibbs (2009), have provided detailed accounts of how to approach teamwork within the context of higher education.

Mitchell et al. (2021) describe how students perceive peer feedback in group development projects. In this study, the researchers observed interpersonal friction as a significant factor for students. Mitchell et al. (2022) suggest that peer evaluation within game development projects can lead to increased attainment. The authors however also note the challenges of implementing peer assessment due to the additional workload required for high-quality feedback and the expectations of professionalism it places on students. As Harvey (2019) highlights teamwork in game development education is "*tempered by a hyper-individualistic ethos that set those working in temporary partnerships in opposition to each other in a competitive market of applicants to the industry*" (p. 763).

Bergstrom (2022) argues that game educators must be aware of the cultural factors in the classroom, such as toxicity issues in gaming communities (Paul, 2018). In addition to toxicity, imitating industry practice may run the risk of reinforcing crunch culture as a desirable method (Weststar & Dubois, 2022). As Weststar and Dubois highlight "*unlimited, unpaid overtime to meet project milestones – called 'crunch' – is a well-documented practice that has negative effects on physical and psychosocial well-being*" (2022, p. 2). Issues such as crunch and toxicity are important factors as they can impact students continuing participation in the field (Bergstrom, 2022). Game design educators then must be aware of not only what elments of industry practice they wish to adopt but also which to challenge.

Some researchers have looked beyond the game industry for approaches to game development. One example of this is Rilla Khaled's *Reflective Game Design* (2018) which seeks to reframe game design as a critical artistic practice and is informed by the emergence of critical design practices within interaction design (Sengers et al., 2005). Another example is Rouse and Malazita (2023) who discuss an MS/PhD in Critical Game Design that seeks to

combine "critical perspectives, research, and hands-on making" (p.97). These approaches may help to address the challenges around preparing students for practice while ensuring sufficient critical and independent thinking.

This section has shown the complexity of factors related to the social aspects of game design projects in the context of higher education. The close relationship between the design of many game development programmes and industry suggests an academic discipline closely related to practice. This relationship however creates a number of potential issues such as a focus on individualisation, student/gamer identity, and unhealthy working practices such as crunch. As outlined the focus on industry readiness may also limit creativity within the classroom and limit risk-taking among student designers. M. Davis (2017) describes the studio project as the signature pedagogy of design. The following section will discuss a number of approaches that educators employ within the game design classroom.

2.2.2 Game Design Supports

A number of conceptual supports to support game design, such as brainstorming, game design patterns, and VNA Cards can be employed within the classroom. This section discusses these supports and provides an overview of their application within game design learning.

Brainstorming

Structured idea-generation techniques are often employed within games education. Fullerton (2019) describes the initial step of brainstorming as an individual process moving from developing player experience goals to testing a written design treatment with potential players. This is similar to the iterative process in other disciplines as it moves from initial game ideas to testing out written treatments with players in a cyclical loop.

The process outlined by Macklin and Sharp (2016) similarly starts with conceptualisation via techniques such as brainstorming, motivations and design values to develop an initial

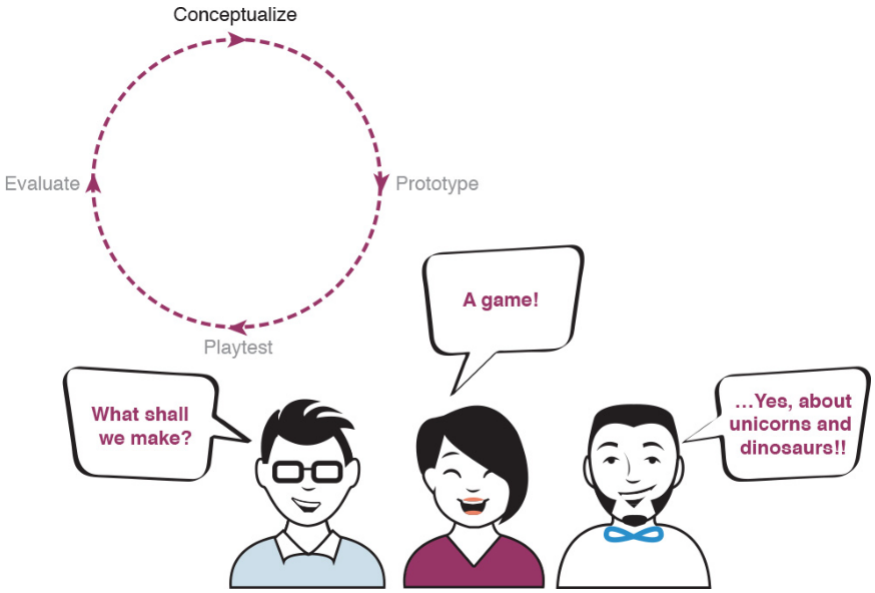


Figure 2.7 The conceptualise phase of the game design process by Macklin and Sharp (2016, p. 356) highlights the exploratory nature of this phase.

concept for a game before refining it further (See Figure 2.7). Methods for brainstorming such as *Idea Speed-Dating* (p. 359), *'How Might We...' Questions* (p. 361), and *Noun-Verb-Adjective Brainstorming* (p. 364) are suggested as methods to generate game concepts. However, a number of authors suggest that brainstorming is less effective than guided ideation supports (Henderson et al., 2019; Keshwani et al., 2017).

Game Design Patterns

The concept of game design patterns is an adaptation of Alexander, Ishikawa, and Silverstein's concept of architectural patterns (1977). They propose that every pattern "*describes a problem that occurs over and over again in our environment, and then describes the core solution to that problem, in such a way that you can use the solution a million times over, without ever doing it the same way twice*" (p. x). Within the field of games, Björk and Holopainen published *Patterns in Game Design* (2005) which sought to adapt the concept of pattern design to the design of games. Since then their wiki has gathered more than 700 patterns (www.gameplaydesignpatterns.org) for game design. Other approaches to pattern design for



Figure 2.8 Sample of Verb Noun Adjective Cards (VNA Cards), Kultima (2017, p. 3) used to aid game designers in developing novel concepts.

games include Adams and Dormans (2012) game mechanics and associated Machinations (www.machinations.io) design tool as well as Christopher Barneys *Pattern Language for Game Design* (2021). These pattern approaches represent a formal way of analysing game design, which can also form the basis for designing solutions to common design problems.

VNA Cards

Kultima et al. (2008) developed a series of game idea generation games: *VNA Cards* (Verb, Noun, Adjective), *GameSeekers* and *GameBoard* as supports for discipline-specific creativity. In initial studies, they found benefits from the use of these interventions despite some of the complexities around the game systems on which they are built. Kultima (2017) studied using VNA cards (See Figure 2.8) to develop game concepts and their impact on design fixation. In this study, the participants were paired and produced 100 game ideas (5 ideas per pair). While there was no control group, Kultima found that the ideas generated were varied and showed unique attributes, with only two similar ideas being developed.

Beyond these examples, Ho (2017) suggests other supports such as *Oblique Strategies*, *SCAMPER* (Eberle, 1972), *IDEO Method Cards* (IDEO, 2003) and *Values at Play* (Flanagan & Nissenbaum, 2014). Neil (2015) developed a tool to support the design process through a participant-observer approach. These represent structured approaches to supporting the design process for video games, particularly for the synthesis of game concepts.

This section has reviewed the literature on game design learning. The discipline of game design education is a relatively young field, however, the literature provides a number of insights into how it is structured. Many programmes draw on industry practices to ensure that graduates are prepared to enter the workforce. This however creates a number of challenges for educators who seek to balance this with more critical and creative approaches. While some conceptual supports exist within the literature, there is limited evaluation of these. This presents the opportunity to explore game design classroom support further.

From the review of the literature on game design education, a number of key factors have been uncovered:

- Many educators and game development programmes seek to simulate aspects of industry practice to ensure graduate employability. This alignment often occurs at the stage of course design, however, gaps between game development in an academic context and professional practices remain.

- Alignment with the game industry creates a number of challenges within the context of game design learning. Firstly, it may limit student creativity and risk-taking as students focus on what projects might appeal to the industry. It may also lead to students focusing on individual performance over team/peer performance as students compete in the job market after graduation. Finally, it has the potential to reinforce toxic gamer cultures and cultures of overwork that persist within the game industry.

- The game development project is where much of the complexity of game design becomes apparent to students. A number of conceptual supports are suggested for supporting students, however, there is limited data on the efficacy of these approaches for game design specifically.

The literature provides insight into the types of work game design students engage in and the potential challenges educators face. There is however a lack of first-hand accounts of

how educators structure the game design process for students and how students apply game design approaches within game development projects. This led to the formulation of the second and third research questions:

> *RQ 2: How do educators structure game design learning in higher education?*

> *RQ 3: In what ways do students apply game design approaches within game development projects?*

By interviewing educators and conducting an observational study within the game design classroom it is hoped that further insights into game design learning can be uncovered. Similar to the first research question these insights will inform the design of educational supports for use in game design learning. The following section will discuss the process of researching game design and the role of design in general within the context of the research.

2.3 Game Design Research

There a number of different approaches to studying the game design process within the literature. This research was carried out within the sub-discipline of *game design research*. According to Lankoski and Holopainen (2017), game design research aims "*to uncover new facts and insight about game design, design processes, or games as designed objects; that is, to gain new knowledge and understanding about game design*" (p. 1). Game design research builds on the research from within the discipline of design and applies the theories and methodologies of design to the study of games (Kultima, 2015). Coulton and Hook (2017) argue that game design research is underrepresented in the games research community and that practice-based design research could bridge the gap between academia and industry. Kultima (2015) suggests that game design research should be understood as a part of general design research and that understanding game studies as design research can improve our

understanding of game design. Critical game design has recently emerged as an approach and seeks to connect critical theory with game design research (Malazita & O'Donnell, 2023). These approaches suggest that game design research is a diverse and evolving field encompassing various approaches. Specifically, a design-based approach to understanding the design processes may present opportunities to gain new insights into the game design process and to support game design learning.

Several authors have applied a design-based lens as a research approach to the study of games. For example, Chiapello (2014) explored Schon's epistemology of design practice in relation to the development of mobile games. Through interviews with developers, this research uncovered a new perspective on mobile, casual and social games, which highlights the potential contributions that can be generated from applying design approaches to the study of games (Chiapello, 2014). Researchers Marcotte and Khaled (2017) used a design-based lens to analyse the practices related to critical game design. In their research, new methods to study the practices of game designers were proposed that provided unique insight and potential for future refinement as game design research methods. Similarly, Khaled and Barr (2023) propose a method for game design materialisation that uses version control and designer journals to document the design process. This method aims to make tacit knowledge in the game design process explicit to help bridge design materiality with STEM[1] disciplines. These examples are provided to show the potential benefits that can be gained by using a design-based lens when analysing the game design process.

A related discipline to game design research is that of game production studies. It is "*a specific perspective that emphasizes the cultural, economic, political, and social circumstances in which games are created and the production cultures associated with video game development*" (Sotamaa & Svelch, 2021, p. 11). This is of relevance to this research as the context and production culture within which games are developed can impact the design process and outcome. For example, de Smale et al. (2019) studied the design of moral

[1] STEM is an acronym for the disciplines of science, technology, engineering and maths.

gameplay in the game This War of Mine (11 Bit Studios, 2014). By interviewing developers at 11 Bit Studios de Smale et al. developed an understanding of the design context and the process of designing moral gameplay. To do this, they also drew on the concept of Gamework (O'Donnell, 2014) and production contexts (Bourdieu et al., 1993; Thompson, 1995). This example highlights the value of considering design research within the broader context of production studies. Bódi (2022) combined research into the design ethos of game studios with textual analysis to study how designers approach player freedom in game design. Game production studies present the opportunity to develop a greater understanding of the context in which design takes place. By considering the context of game production the research can arguably consider design from a wider perspective than purely design-based approaches.

In a study by D. Godin et al. (2020) they propose *Game Development Praxiography* as a way to study the game development process and create links between industry and practice. This approach draws on research within Practice Theory (specifically Praxiography) and Design Studies (specifically, Research through Design or RtD). Godin et al. view this as a way to "*operationalize a knowledge-gathering pipeline from industry settings*" (2020, p. 17). This methodology, however, requires a team of researchers with industry-relevant skills and an industry partner willing to bring the researchers *in-house*. It may not be practical in many cases and also may not necessarily be desirable when the researcher's goal is to understand practice within naturalistic settings.

The research was carried out within the game design research/critical game design sub-disciplines of game studies, informed by production studies in order to gain an understanding of the design process and the context in which game design takes place. The following section will provide background to the discipline of design as a field of academic study.

2.3.1 Design as Discipline

The 1962 *Conference on Design Methods* is widely regarded as the origin of design methodology as a distinct academic discipline. Bruce Archer argues that the discipline of design can be seen as separate from science and humanities: "*it relates with configuration, composition, meaning, value and purpose in man-made phenomena*" (1979, p. 20). For Archer, the nature of design can be seen as something different from science and humanities as it focuses on the study of created works.

> *The essential language of Science is notation, especially mathematical notation. The essential language of the Humanities is natural language, especially written language. The essential language of Design is modelling. A model is a representation of something. An artist's painting is a representation of an idea he is trying to explore. A gesture in mime is a representation of some idea. Everybody engaged in the handling of ideas in the fine arts, performing arts, useful arts or technology employs models or representations to capture, analyse, explore and transmit those ideas.*
>
> (1979, p. 20)

The above extract from Archer highlights the line he draws based on the languages of the discipline (See Figure 2.9). Prototypes and models are a core aspect of how designers move the project forward (Yang, 2005). Similarly, Andreasen (1994) highlights the significance of modelling within designerly activity as the core practice of designers. Another factor distinguishing design from other disciplines is that it is often focused on ill-defined or wicked problems (Buchanan, 1992; Rittel & Webber, 1973). These are problems without correct solutions and where all the variables are not and can not be known to the designer (Cross, 2006).

Cross defines three main categories of design research as follows:

> - *design epistemology – study of designerly ways of knowing*
> - *design praxiology – study of the practices and processes of design*
> - *design phenomenology – study of the form and configuration of artefacts*
>
> (2006, p. 101)

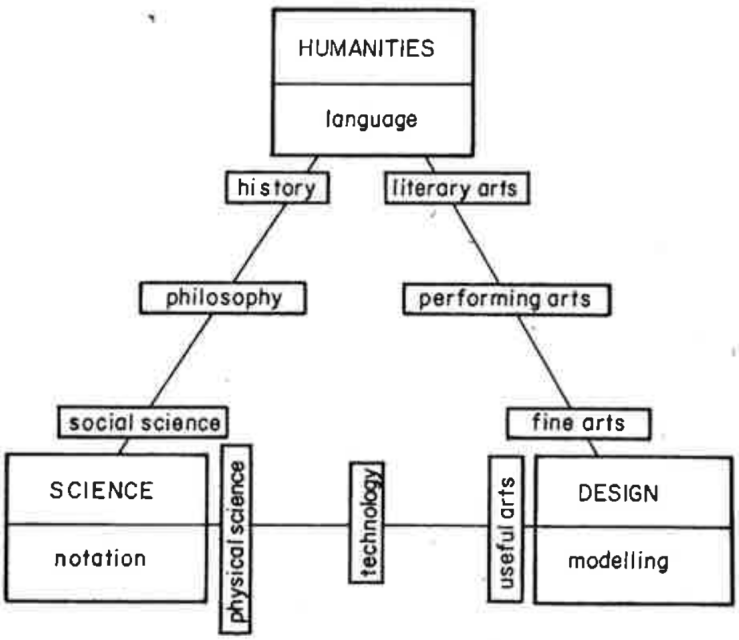


Figure 2.9 Design as a distinct discipline from humanities and science, from Archer (1979, p. 20).

Cross describes these categories as the study of people, processes and products respectively. In the case of game studies, we might consider these to be the designers/developers, the game design process, and games as designed artefacts. Cross describes how throughout his career, he has moved from studying design methodology to design epistemology and cognition (2018). He sees this as a "*fundamental personal re-orientation away from the early design science of CAD and design methodology towards a science of design based on design epistemology, cognition and praxiology, necessary to underpin design as a discipline*" (2018, p. 706).

The term designerly thinking is used throughout this thesis and is distinct from design thinking. Design thinking is a problem-solving methodology often applied in business and management contexts (Laursen & Haase, 2019). It involves a set of practices and methods aimed at understanding user needs and preferences, ideating solutions, prototyping and testing ideas in order to design successful products or services that meet those needs (T. Brown, 2008). In the Harvard Business Review Tim Brown, the CEO of design consultancy IDEO

describes design thinking as "*a methodology that imbues the full spectrum of innovation activities with a human-centered design ethos*" (2008, p. 1). On the other hand, designerly thinking refers to ways of thinking that are unique to designers (Cross, 1982). It is grounded in the study of design and aims to link theory and practice within this field (Johansson-Sköldberg et al., 2013)). Laursen and Haase (2019) reviewed literature related to *Design Thinking* and *Designerly Thinking* and found that design thinking focuses on prescriptive actions. On the other hand, designerly thinking suggests methodological approaches and is descriptive of potential actions for designers to take. This relates to the concept of Wicked Problems (Buchanan, 1992) that have no right or wrong answer. Buchanan theorises that this is because:

> *Design problems are "indeterminate" and "wicked" because design has no special subject matter of its own apart from what a designer conceives it to be. The subject matter of design is potentially universal in scope, because design thinking may be applied to any area of human experience. But in the process of application, the designer must discover or invent a particular subject out of the problems and issues of specific circumstances.*
>
> (1992, p. 16)

In design education, learners take on the role of designer and are active in their own learning. This is evident in the development of many signature pedagogies of design, such as the design studio and the crit. The constructivist approaches of scholars such as Bruner, Piaget and Vygotsky are also evident in the design studio as learners are situated in a design community and construct their own knowledge through working on a variety of project briefs (M. Davis, 2017). Baynes (2008) highlights how this learning has relevance beyond the traditional design discipline, and elements of this approach are evident in many game design programmes. This section has provided an overview of research in the discipline of design and highlighted designerly ways of working. The following section will discuss models of the design process.

2.3.2 Models of the Design Process

Within design studies, the development of models of design has been an area of extensive research since the 1950s (Wynn & Clarkson, 2018). Gericke and Blessing outline the objective of design models as:

> *... to permit design to be taught and transferred, to facilitate planning, to improve communication between disciplines involved in design, etc., was motivation for many researchers to develop prescriptive or normative models of the design process, the so called design methodologies, to support designing.*
>
> (2011, p. 1)

Design models seek to provide designers and educators with a shared vocabulary and the ability to talk about the process, refine it and critique it (Dubberly, 2005). Bravo and Bohemia (2021) suggest the value of design models in education is as a didactic tool mediating between the instructor and the outcomes of design.

> *The representations of design process models contribute towards production of the design professional culture. It is through the production, circulations and consumptions of these design process models which contribute to 'shared values' amongst the designers and others who are wishing to adopt this way of working. Images of the design process models, in part, give a meaning to what it means to design (act) and to be a designer (identity).*
>
> (p. 13)

Several design process models have been developed within design studies that detail the design process within fields such as product design, architecture, interaction design and more. Cross (2018) describes how "*design methods externalised some of the activities of designing and could be taught in an explicit way*" (p. 696). Within design studies, there has been debate around the role of design models, with some of the early proponents of design methodology distancing themselves from the field:

> *There is a near universal fear and loathing of methodology, and methodologists are reviled as impoverished creatures who merely study, rather than practise,*

> *a particular art or science. Voltaire said 'Theology is to religion what poison is to food', and there are many who would draw the same parallel between methodology and design. One critic, Christopher Alexander, has said, 'If you call it, "It's a Good Idea To Do", I like it very much; if you call it a "Method", I like it but I'm beginning to get turned off; if you call it a "Methodology", I just don't want to talk about it' (Alexander, 1971). Design methodologists found this comment particularly wounding since it came from one of the world's leading design methodologists!*
>
> (Cross, 1984, p. vii)

Many critics of design methodology felt that this approach to the study of design removed the intuition and experience of the designer. However, as Lloyd (2019) highlights:

> *In practice using a design method leaves the individual or group to make subjective judgements about objective data. A method guides and challenges designers to consider things outside of their intuition and preconceptions; they were never meant to enslave the designer in a mechanical process where their judgment has no value. [...] However many cost-benefit analyses, brainstorms, quality function models, or morphological charts are deployed, the integrity of the design lies with its designers.*
>
> (p. 170)

Wynn and Clarkson (2018) reviewed design and development models and found that they can be categorised into micro, meso, and macro-level models. These correspond to individual process steps, end-to-end flows of activity, and organisational and management-level models respectively. Many game design models correspond to the meso and macro level of design, focusing on project stages, deliverables and life cycles (Adams, 2010; Fullerton, 2019; Lemarchand, 2021). Less focus has been given to the micro design process, the individual or small group process of design, as it relates to game design.

Jones (1963) proposed a model of design based on the activities of analysis, synthesis and evaluation as the fundamental activities of the designer. Analysis is the process by which designers understand the problem space, synthesis is the process by which ideas are generated, and evaluation is the process by which potential solutions are evaluated. Evbuomwan et al. (1996) reviewed design models within the literature and found that many of them included

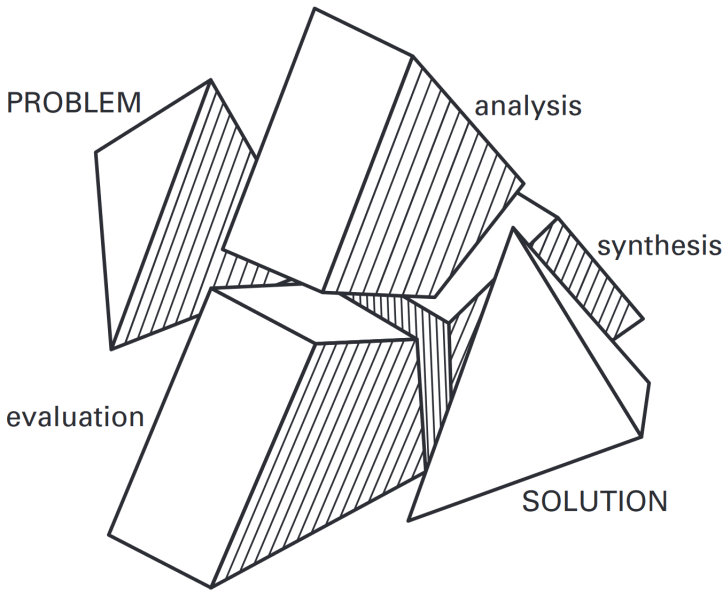


Figure 2.10 The design process model by Lawson (2010, p. 49) shows the three activities of analysis, synthesis and evaluation as activities occurring between the design problem and solution.

iteration and emphasised the activities of analysis, synthesis, and evaluation. Jones proposed this as a method of design, and it has become widely accepted as the basic design process model (Cross, 1984). Cross describes this model as providing "*a rational framework within which the irrational has its own space and time*" (p. 2). This model was later expanded by Lawson (2010) who frames the steps not as an ordered process but as activities that occur during the process as a negotiation between problem and solution. The model (See Figure 2.10) is a simplification of the process but is intended as an aid to describe the process without prescribing an order or rigid steps to be followed.

Lawson's model moves through iterative cycles of analysis, synthesis and evaluation and can occur on various scales, from sketching solutions to potential problems to developing prototypes to testing and evaluating solutions. Analysis involves building an understanding of the design problem by identifying the problems, patterns and relationships in a given design task, it refers to the "*ordering and structuring of the problem*" (2010, p. 37). Synthesis is

the process of generating solutions and is focused on moving the design forward, it is the "*attempt to move forward and create a response to the problem – the generation of solutions*" (2010, p. 37). Evaluation is the process of testing the design and involves the "*critical evaluation of suggested solutions against the objectives identified in the analysis phase*" (2010, p. 37).

The concept of problem and solution has been explored in-depth in the design literature. Various theorists view designers as moving from a problem (providing the impetus to a design process) to a solution (providing an end to the process). Problem and solution are often seen as complimentary processes, and in design, the problem can evolve as the solutions emerge. Dorst and Cross (2001) describe this as the *co-evolution of problem and solution*, where designers work within a problem space to identify potential problems and solutions to them. Lawson (2010) describes the design process as occurring between problem and solution but not necessarily prescribing a linear relationship from problem to solution but rather elements of the process. Within game studies, Kuittinen and Holopainen (2009) have explored problem and solution from a theoretical perspective. However, there is a lack of empirical research on this aspect of the game design process. This suggests that there is potential to better understand how game designers consider their own work in the context of problem-solution framing.

This section has reviewed the literature on game design research and design in general. Game design research presents a perspective that is suitable for the study of the game design process, in particular when combined with aspects of game production studies and critical game design. The discipline of design has a tradition of research into the design process and suggests numerous similarities between the work of game designers and the design process in general. In addition, models of the design process serve as communication tools and pedagogical interventions within the design process and aid in the understanding of how designers work.

From the review of the literature on game design research, a number of key factors have been uncovered:

- Game design research involves the application of the approaches from design research to the study of the design of games. The related areas of critical game design and game production studies may be beneficial in addressing the challenges highlighted in the previous section which looked at game design education.
- The discipline of design looks at designerly ways of working and explores how designers tackle wicked problems. Many of the approaches employed by designers in other disciplines are similar to those employed by game designers. However, there is a lack of research on where the similarities and differences lie between game design and other design disciplines.
- Models of the design process serve a number of functions primarily in relation to communication and education. They enable designers to discuss their process in a shared language and can allow educators to communicate the process to students.

The literature highlights the rationale for the game design research approach undertaken within this project. Design models at the level of fundamental designerly activity are lacking within the discipline of game design and there is the potential to develop these from the existing models within design. In order to develop support for game design learning a model will be developed based on the fieldwork undertaken in answering the previous questions. This led to the formulation of the final research question:

> *RQ 4: How might a model of game design learning aid in the development of classroom supports for the acquisition of game design expertise?*

By developing a model of the game design learning process based on the literature and findings from the previous questions a number of supports will be developed. The

development of the supports and reflections on their implementation within game design learning will also be discussed.

2.4 Conclusion

This chapter has provided a review of the relevant literature in relation to game design practice, game design education and game design research. It began by providing an overview of the discipline of game design and reviewed the literature related to game designers and the processes employed by them in the development of games. Following this, the review looked at how game design education takes place and the role of higher education. Finally, the literature review looked at the process of game design research and the potential of applying this approach within the project. The research questions emerged from the literature review and broadly seek to provide further understanding of game design learning. The following chapter will discuss the qualitative research methodology and the chosen methods in detail as well as provide an overall picture of the scope of the research project.

Chapter 3

Methodology

This chapter will discuss the nature of the qualitative inquiry that forms the basis of this research project. The research is conducted through the qualitative paradigm (Creswell & Poth, 2016) and draws on the *Design Research Methodology* (DRM) that was developed by Blessing and Chakrabarti (2009). The qualitative methods of interviews and observation were employed in this project to gather rich data on game design learning. The chapter begins by outlining the theoretical perspective employed in the research and documents the overall research methodology. It then discusses the methods and units of analysis used to conduct this project. The chapter concludes by outlining the data analysis and ethical considerations governing the research.

3.1 Theoretical Perspective

This research has been conducted through a qualitative approach and was carried out from a social constructionist perspective. Researchers often take one of three approaches to conduct social research: quantitative, qualitative and mixed-methods (Creswell & Poth, 2016). The quantitative approach borrows from the 'natural' sciences and focuses on measurement and quantification; these sources are used along with deductive logic to arrive at their findings. In

contrast, qualitative research proposes that understanding social situations requires a more inductive or abductive approach where data is gathered and reported with little or no focus on numerical data or statistical analysis. Finally, mixed-method approaches combine qualitative and quantitative sources to generate a broader understanding of the phenomenon, including numerical data and qualitative accounts.

Guba and Lincoln define research paradigms "*as basic belief systems based on ontological, epistemological, and methodological assumptions*" (1994, p. 107). They outline four primary inquiry paradigms: positivism, postpositivism, critical theory and related ideological positions, and constructivism. Cresswell and Poth describe these as the "*guiding philosophy behind qualitative research*" (2016, p. 54). Positivism and postpositivism both aim to explain phenomena with the ultimate aim of prediction and/or control. This is the traditional paradigm within the sciences where the researcher aims to provide some objective truth. Critical theory and related ideological positions aim to critique and transform the topic of study through advocacy and activism. Finally, the constructivist researcher seeks to understand and reconstruct the knowledge they uncover with the aim of building consensus but remains open to new and more sophisticated interpretations. Similar to critical theory, the researcher may have the role of advocate and activist as well as facilitating and participating in the research (Guba & Lincoln, 1994).

I conducted this work as a participant-observer with experience, expertise and participation in the phenomenon under investigation. This includes many of the interviewees that I knew through professional networks and also students who participated in my classes. The research is also informed by my experience prior to starting this PhD in both industry and academia. Below I will outline the ontological, epistemological and methodological assumptions that informed this work.

The ontological position of the qualitative research paradigm relates to the nature of social reality and what the researcher can uncover about it (Hesse-Biber, 2017). Guba

and Lincoln propose relativism as the ontology of constructivism. Relativism proposes that realities can be apprehended in the form of "*multiple, intangible mental construction, socially and experientially based, local and specific in nature [...] and dependent for their form and content on the individual persons or groups holding the constructions*" (1994, pp. 110-111). Within this research project, I sought to understand game design learning from multiple perspectives in the words of the participants themselves. Firstly by interviewing game designers to gain insight into the game design process, then by interviewing game design educators to understand how they structure this learning and finally by observing how student learning takes place in the game design classroom. As will be discussed below, the qualitative coding process employed within this research aimed to capture the realities of participants in their own words.

The epistemological question relates to the nature of the relationship between the researcher and what can be known (Hesse-Biber, 2017). Guba and Lincoln propose that epistemology is transactional and subjectivist within the constructivist paradigm. Within this epistemology, the "*investigator and the object of investigation are assumed to be interactively linked so that the 'findings' are literally created as the investigation proceeds*" (1994, p. 111). As the researcher and the participants co-create the findings, this epistemological position questions the divide between epistemology and ontology (Waller et al., 2015). Waller et al. highlight that the constructivist researcher must choose how much of a voice to give the research participants. In this PhD research, the participants are given voice in the fieldwork chapters (Chapter 4: The Practice of Game Design, Chapter 5: Structuring Game Design Learning & Chapter 6: Experiencing Game Design Learning). Direct quotation is used throughout the fieldwork chapters to capture the voice of participants. Additionally for each of the supports, I reflect on their outcome and the experience of implementing them in Chapter 7 (Supporting Game Design Learning). Finally, in the conclusion of the thesis, I include a reflective account of the research as a whole.

The methodological approaches employed within qualitative research must be consistent with both ontology and epistemology. This means that when a researcher approaches a subject from a constructivist paradigm, they must ensure the methods they employ align with their beliefs. Guba and Lincoln suggest that the constructivist researcher should use hermeneutical and dialectical methods. Within the constructivist paradigm, "*individual constructions can be elicited and refined only through interaction between and among investigator and respondents*" (1994, p. 111). This approach results in the application of research methods intended to generate rich data and provide thick descriptions (Waller et al., 2015). The methods employed in the research are interviews and observation. These methods generated rich data both from the voice of the participants and also from my own fieldnotes. This data was then analysed through qualitative coding (Saldaña, 2016) to generate findings in an inductive-abductive research approach.

This section has provided an overview of the theoretical perspective of constructivism that was employed within the research, including its ontology, epistemology and methodological questions. Additionally, it has described how the constructivist paradigm influenced these areas of the research. The following section will discuss the research methodology and the implementation of the research approach.

3.2 Research Methodology

As outlined in the previous section, the constructivist paradigm led to the selection of qualitative research methods. The qualitative approach allowed for rich understandings and insights to emerge and provided unique perspectives as part of an exploratory research project (Robson & McCartan, 2016). The research also draws on the *DRM: A Design Research Methodology* (Blessing & Chakrabarti, 2009) to structure the phases of the inquiry. As a qualitative study, the methodology employed aims to produce thick descriptions, be naturalistic, grounded in the data, and defined in terms of transferability (Cohen et al., 2017).

Table 3.1 The eight "Big-Tent" criteria for excellence in qualitative research, from Tracy (2010, p. 840).

Criteria for quality (end goal)	Various means, practices, and methods through which to achieve
Worthy topic	The topic of the research is • Relevant • Timely • Significant • Interesting
Rich rigor	The study uses sufficient, abundant, appropriate, and complex • Theoretical constructs • Data and time in the field • Sample(s) • Context(s) • Data collection and analysis processes
Sincerity	The study is characterized by • Self-reflexivity about subjective values, biases, and inclinations of the researcher(s) • Transparency about the methods and challenges
Credibility	The research is marked by • Thick description, concrete detail, explication of tacit (nontextual) knowledge, and showing rather than telling • Triangulation or crystallization • Multivocality • Member reflections
Resonance	The research influences, affects, or moves particular readers or a variety of audiences through • Aesthetic, evocative representation • Naturalistic generalizations • Transferable findings
Significant contribution	The research provides a significant contribution • Conceptually/theoretically • Practically • Morally • Methodologically • Heuristically
Ethical	The research considers • Procedural ethics (such as human subjects) • Situational and culturally specific ethics • Relational ethics • Exiting ethics (leaving the scene and sharing the research)
Meaningful coherence	The study • Achieves what it purports to be about • Uses methods and procedures that fit its stated goals • Meaningfully interconnects literature, research questions/foci, findings, and interpretations with each other

Tracy (2010) suggests eight *big-tent* criteria for excellence in qualitative research (See Table 3.1). These criteria are: worthy topic, rich rigour, sincerity, credibility, resonance, significant contribution, ethical, and meaningful coherence. While these criteria may not be the only way to ensure the quality of the research (Cohen et al., 2017), they provide a structure which can be used to address these topics in the context of this PhD. The following section will discuss this research under each "big-tent" criterion.

Worthy Topic

This research seeks to aid in understanding how game design learning takes place in higher education contexts. The *2020 European Video Games Industry Insights Report* identified 765 institutions across 25 European countries offering programmes in game development (European Game Developers Federation, 2022). This PhD addresses a topic of growing importance as game design, and development programmes become common features in higher education.

Rich Rigour

This research builds off the literature on game design, education and design to propose a model of the game design process. By conducting two rounds of interviews and an observational study, it aims to identify the nature of game design practice, education and learning to generate a coherent theory of the topic. Finally, it utilises my experience as an educator to develop educational supports, and reflect on game design learning approaches informed by the research.

Sincerity

Within this thesis, I have outlined my role as the researcher as well as the theoretical perspective I employed. This chapter discusses the methodology in detail, which, along with the conclusion, acknowledges the limits and challenges of the research. In addition, the research includes extracts from my fieldnotes to provide reflexivity and transparency.

Credibility

I have attempted to provide a *thick description* throughout this thesis (Ponterotto, 2006). In this chapter, I use thick descriptions both in terms of describing the participants without affecting anonymity and in describing the research procedures to provide context to the

findings. Within the following fieldwork chapters, I document the results in the voice of the participants through direct quotations. Triangulation is attained by examining game design learning from three angles: that of practitioners, educators, and students. Moreover, this is supported by combining the approaches of interviewing and observation.

Resonance

The concept of resonance or empathetic validity in qualitative practitioner research refers to the potential to "*transform the emotional dispositions of people towards each other*" (Dadds, 2008, p. 280). Dadds outlines empathetic validity as both internal and external. This research brought me closer to my teaching, and, in particular, the student study discussed in Chapter 6 (Experiencing Game Design Learning) fundamentally changed my view of how students learned game design and the complexity of the task that faced them. Through the descriptions provided in this thesis, I hope to bring the reader closer to the unfamiliar perspectives they might encounter in their own practice and build empathy with the participants.

Significant Contribution

External evidence of the contribution of the research is included in the list of research outputs which includes a list of all publications and conference publications arising from this research (Section 1.7: Dissemination). The research aims to improve knowledge of game design learning and teaching practice within higher education game design programmes (Section 1.6: Research Contribution). It also provides an account of design supports that were developed through the research findings to illustrate how educators might transfer theoretical knowledge to the classroom context. Finally, I hope the research encourages other game design educators and researchers to explore the topic further and generate new understandings.

Ethical

Tracy (2010) suggests that the qualitative researcher should consider ethical concerns from four perspectives: procedural, situational, relational, and exiting ethics. Ethics approval for all fieldwork was sought and approved by the research ethics committee at TU Dublin. Section 3.4.1 (Ethical Research) of this chapter discusses this project's procedural ethics and considerations in detail. Throughout this research I attempted to ensure that I always treated participants with respect and with an awareness of my relationship with them both within the research and without.

Meaningful Coherence

Meaningful coherence refers to studies that "*interconnect their research design, data collection, and analysis with their theoretical framework and situational goals*" (Tracy, 2010, p. 848). The qualitative approach and constructivist paradigm aligned with the methods employed in the research were chosen due to their suitability to provide the richest data within the context of this PhD.

Tracy's *Eight "Big-Tent" Criteria for Excellent Qualitative Research* (2010) were employed to provide an overview of the concerns relating to quality and reliability within a qualitative inquiry of this kind. The following section will introduce DRM as a research methodology in design, describe how it was employed within the research and discuss the methodological fit between DRM and qualitative research.

3.3 DRM: Design Research Methodology

DRM, a design research methodology, focuses on the "*formulation and validation of models and theories about the phenomenon of design ... in order to improve design practice, management, education and their outcomes*" (Blessing & Chakrabarti, 2009, p. 9). The

overall goal of DRM is to address issues of fragmentation within design research, a lack of the use of results in practice and a lack of scientific rigour. Blessing and Chakrabarti see these as problems that a structured methodology can solve and thus propose DRM as an approach. They suggest that when used flexibly, the methodology "*should help make design research more effective and efficient*" (Blessing & Chakrabarti, 2009, p. 12).

The choice of research methodology determines the approach to knowledge generation and the methods employed to answer research questions. To provide a justification, I employ the *Research Onion* by Saunders et al. (2009) as well as Gregor (2006) and Gregor and Jones (2007) to signpost my ontological, epistemological, and axiological positions, that guided the selection of DRM as the research methodology.

As outlined in section 3.1 this research was conducted within the constructivist paradigm. My ontological stance aligns with a relativist perspective, which acknowledges that reality is socially constructed and that multiple interpretations of phenomena exist. Within a design-research framework, I recognize that knowledge is generated through iterative processes, where each cycle of design and evaluation contributes to a deeper understanding of the research problem. This aligns with the idea that reality is not static but continually evolving as new design solutions and insights emerge.

Epistemologically, I adopt a transactional and subjectivist stance, emphasizing the importance of individual perspectives and experiences in generating knowledge. In this research, I place an emphasis on understanding the experiences of practitioners, educators, and students in the field of game design learning. This approach acknowledges that different stakeholders have unique insights into the complexities of game design learning.

My axiological position is value-laden, as I recognize the importance of the research being conducted for a specific purpose, particularly in the context of improving game design education. The research is value-driven, aiming to enhance the quality of my own teaching and positively impact students, educators and practitioners in the field.

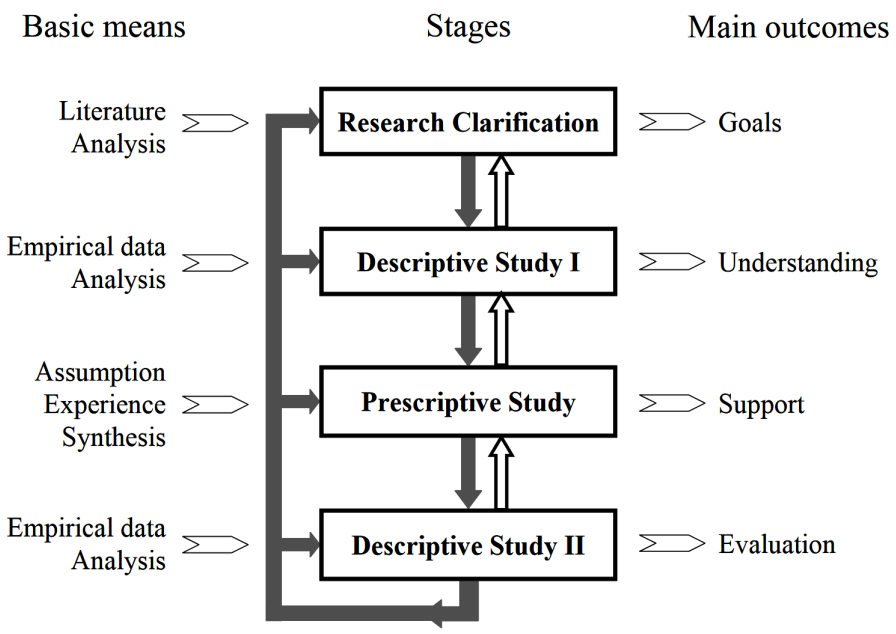


Figure 3.1 The DRM framework by Blessing and Chakrabarti (2009, p. 15) showing the potential stages in a design research project, the means employed and the main outcomes.

Blessing and Chakrabarti's (2009) Design Research Methodology aligns with these ontological, epistemological, and axiological positions. This methodology places an emphasis on iterative design and evaluation cycles, reflecting the evolving nature of knowledge and the importance of individual perspectives.

The research framework employed within this methodology involves up to four stages depending on the nature of the inquiry: Research Clarification, Descriptive Study I, Prescriptive Study, and Descriptive Study II. Figure 3.1 highlights the relationships between stages as well as the methods and outcomes. The DRM should be applied in an iterative process and not in a rigid or linear manner, due to this work from one stage can inform other stages of the research.

The Research Clarification (RC) involves a review of the literature to develop research goals and theoretical models of the design situation. The Descriptive Study I (DS-I) focuses on empirical research to build an understanding of the design situation as well as where and how supports might be developed. The Prescriptive Study (PS) involves the development

of and reflection on design supports based on the understandings uncovered in the previous phases of the research. The final potential phase in a DRM project is the Descriptive Study II (DS-II), whereby the supports are empirically evaluated to identify their suitability to address the project's goals.

Blessing and Chakrabarti propose seven possible combinations of DRM for design research projects. The choice of project type is related to whether a review-based, initial, or comprehensive study is required in each stage and the goals and resources of the project. A review-based study takes place when there is sufficient existing literature and examples from practice to develop an understanding of the project goals. A comprehensive study builds off the literature and involves an empirical study. Finally, an initial study points to initial findings and potential for future work. Blessing and Chakrabarti suggest that types 1-4 are suitable for PhD level projects as they focus on a single comprehensive study within a larger research project. This research is of DRM type 2 and is focused on creating a comprehensive study of the criteria related to the research objectives. Blessing and Chakrabarti describe this type of research as a comprehensive study of the existing situation and discuss the nature of this type below.

> *This type of study is undertaken when the criteria can be established, but a better understanding of the existing situation is necessary to identify the factors that are most relevant to address in order to improve this situation. [...] Once sufficient understanding is gained, an Initial PS is to be undertaken to indicate how this understanding can be used to improve design.*
>
> (2009, p. 61)

As a type 2 DRM project, the research involved a review-based Research Clarification, a comprehensive Descriptive Study, and an initial Prescriptive Study. Table 3.2 below provides an overview of the focus of the investigation, the methods employed and the outputs for each stage of the research project.

The phases of the research can be broadly mapped to the thesis chapters as follows:

Table 3.2 The stages of the research detailing the type, goal, methods and outcome.

	Research Clarification	Descriptive Study	Prescriptive Study
Study Type	Review-based	Comprehensive	Initial
Goal	To develop a theoretical understanding of the game design process.	To develop an empirical understanding of game design learning.	To develop supports for game design learning.
Methods	Literature review	Interviews	Observation
Outcomes	Theoretical game design process model.	Three individual studies and findings related to game design learning.	Three interventions in the game design classroom and reflections.

- Research Clarification: Chapter 1 (Introduction) outlines the background, contribution, and goals of the research. Chapter 2 (Understanding Game Design) reviews the existing literature in relation to game design, games education and game design research, leading to the formulation of the research questions. Chapter 3 (Methodology) presents the methodology and methods employed within the research project. This led to the development of a descriptive study that explored the topic of game design learning from the perspective of game design practitioners, educators and students.

- Descriptive Study: Chapter 4 (The Practice of Game Design) discusses the first phase of the descriptive study, which explored the game design process through interviews with practising game designers. Chapter 5 (Structuring Game Design Learning) presents the findings of the second phase of the descriptive study involving interviews with game design lecturers to develop an understanding of how game design learning is structured in higher education. Chapter 6 (Experiencing Game Design Learning) provides an account of the descriptive study's final phase, which involved observation of game design learning within a game development project. The three phases of the descriptive

study helped provide a comprehensive account of game design learning and provided direction for the following prescriptive study.

- Prescriptive Study: Chapter 7 (Supporting Game Design Learning) describes the development of the game design learning model and three supports for game design learning. Background information, implementation and reflections are included to provide a rich account of the nature of the supports. Finally, Chapter 8 (Conclusion) presents the conclusion to the thesis, proposes directions for future work and reflects on the outcomes of the project.

The following sections provide further detail on the approach taken in each of these studies.

3.3.1 Research Clarification

The research clarification study involves gathering data about the design situation under investigation, in this case, game design learning. The literature review was completed on literature related to game design, games education and game design learning. The literature review also led to the development of the research questions. The following section will discuss the descriptive study, which sought to gain insight into the game design learning process.

3.3.2 Descriptive Study

The descriptive study sought to develop a deeper understanding of the design phenomenon under investigation. This study examined game design learning from three perspectives: designer, educator, and student. These three phases of research involved interviews for the design and educator phases and observation for the student phase. These perspectives were

chosen in order to gain a rich understanding of the process of game design learning and to generate thick descriptions from the data.

Designer

In this fieldwork phase, I conducted interviews with game designers that focused on their experience and creative practice of game design. The goal of these interviews was to develop a richer understanding of the game design process and how designers conceived of their practice in their own words. The interview transcripts were analysed using qualitative methods before developing descriptive themes that captured the design process. This ultimately led to the development of a conceptual map of the themes observed in the game design process. The findings are discussed in relation to the designers' experiences and the literature.

Educator

The second fieldwork phase involved interviews with game design lecturers in the UK and Ireland. Within this phase of the research, the goal was to develop an understanding of how game design learning is structured in higher education. As the research takes place within an Irish context, educators from Ireland and the UK represented a sample that could speak to the topic, given the similarities in the structure of higher education in both countries. The interview transcripts were analysed in the same manner as the previous phase. The findings from this phase were analysed with reference to the literature and the insights uncovered in the previous chapter. This process aimed to identify points of similarity and divergence between the perspectives.

Student

The final phase of the descriptive study looked at the student game design learning experience during a game development project. Through observation, this research phase sought to

understand the experience of game design learning so that it could be contrasted to what happens in practice and the aims of educators. Observational data was gathered through the use of fieldnotes and through the analysis of student development logs (DevLogs) that were published on the game publishing platform Itch.io (www.itch.io) during the project. The DevLogs were analysed and themes were developed through qualitative data analysis. The goal for this phase of the research was to identify how game design learning occurred in the classroom and compare this to practice and educator goals.

The findings from these three phases of the descriptive study provided an understanding of game design learning that could be used within the final stage of the research. This learning was utilised in the development of game design learning supports, as discussed in the following section.

3.3.3 Prescriptive Study

The prescriptive study seeks to propose potential design supports to aid game design learning. For each support, background details are provided detailing why it was chosen, followed by how the support was implemented and finally, a reflection on its effectiveness. The study aims to highlight the potential for game design learning supports emerging from the research. While these supports are discussed in the context of initial interventions in game design learning, they point to future work and highlight potential benefits and limitations of the approach.

To conduct this qualitative inquiry, interviews and observation methods were employed across the fieldwork. The following section will discuss the data collection approaches and their implementation within the PhD research.

3.4 Data Collection

This section discusses the nature of the data collection process for the PhD. It begins by discussing ethics, insider research and my role as a participant and observer. It will then discuss the sampling employed within the research, the specific research methods and the data recording and storage process.

3.4.1 Ethical Research

Within this research, the four basic principles of the *European Code of Conduct for Research Integrity* (ALLEA - All European Academies, 2017) formed the basis of the ethical considerations. The principles of reliability, honesty, respect and accountability were at the core of the research. In addition to this, ethical approval was obtained from the TU Dublin *Research Ethics and Integrity Committee* for the interview and observational studies (REC-18-147 and REIC-21-43). Ethical considerations were influenced by the nature of the study, my relationship with the research and participants, and the treatment of data. All data gathered in the research was anonymised in order to remove any information which could identify individual designers, educators, or students.

Prior to each interview, a copy of the project information sheet was sent (See Appendix A: Project Information Sheets) before an interview was arranged. Only when a participant confirmed an intention to participate was an interview scheduled, consent forms were completed by each interviewee (See Appendix B: Consent Forms), and consent was reaffirmed before and after each interview. Interviewees were informed that all information would remain confidential and that they had the right to refuse to participate or withdraw from the study at any time. After the interviews were transcribed, the interviewees were given an opportunity to redact any sensitive information for inclusion in the final transcript.

In the classroom observation, all students were briefed on the project and given a copy of the project information sheet (See Appendix A: Project Information Sheets). Students

were provided with a consent form where they could indicate their intention to participate or not (See Appendix B: Consent Forms). As the lecturer conducting the study was also the researcher it was made clear to the students that participation would have no impact on student grades and that no analysis of the data would be conducted until after the module assessment was complete. Students were informed that all information would remain confidential and that they had the right to refuse to participate or withdraw from the study at any time. The following section will discuss the nature of insider research and how I navigated the duality of roles.

3.4.2 Insider research

I conducted the research presented in this thesis as an insider, a game designer, an educator and a lecturer. Bonner and Tolhurst (2002) describe the two approaches to participant observation as insider or outsider. They outline the dual roles of the researcher within participant observation as both a participant in the research and also as an observer of it. As this research was conducted on the game design learning process and sought to improve classroom practice, I took on a role as an insider in the project. The advantages of being an insider include having a better understanding of the issue, not disrupting social interaction, and having an increased ability to extract and evaluate the data (Bonner & Tolhurst, 2002). Unluer (2015) suggests the disadvantages of insider research include role duality, overlooking routine behaviours, and bias. Brannick and Coghlan (2007) also highlight that insider research can lead to unique insights as the researcher is seen as "native" to the participants.

An additional factor with insider research is the relationship between the researcher and the participants. In the case of this research project, I have a professional connection with many of the designers and educators interviewed. In addition to this, in the student study, I conducted observation within my own classroom. Taylor (2011) highlights the benefits of conducting insider research within existing relationships and discusses the challenges

encountered. Ethical approval was sought for all studies as outlined above, this ensured that the research approach taken in the studies complied with institutional requirements.

When I reached out to contacts regarding participation in the research via interviews, I included the formal participant information sheet and clarified within the body of the email that participation was optional. Of the sixteen potential participants contacted, twelve expressed an interest in participation and ultimately, ten opted-in to the research. Of these ten participants none withdrew during the study.

While the power dynamics and relationships in the interview studies were largely peer-based, the student study presented a power imbalance (Nolen & Putten, 2007). As they were my students, I was in a position of power as the person setting the coursework and assessing the module. Firstly, all students were given the option to opt-in to the research and were informed that participation would have no impact on the class as the nature of the study was observational. Of the 38 students in the class, 32 opted-in to participate in the research.

Students were informed they could withdraw consent or contact the research supervisor without consequence if they had any concerns. In addition, the data gathered from DevLogs was published publically on Itch.io (www.itch.io) as part of the module submission process, and no data was analysed until after teaching and assessment had been completed. Finally, fieldnotes were taken after class and did not capture specific data about individual students. The following section will discuss the sampling strategies employed.

3.4.3 Sampling

The sampling approaches employed in this research are influenced by the nature of the inquiry and the theoretical perspective discussed earlier in this chapter.

In recruiting interview participants, I used a combination of purposive sampling. According to Gill (2020) purposive sampling involves selecting "*participants who are knowledgeable about the phenomenon being studied*" (p. 580). This was done as I have an

existing network of professional game design contacts and educators who I have met over my career. I used a purposive sampling approach where designers were approached to represent a variety of experiences in order to generate rich data and to understand game design learning from multiple perspectives. Game design practitioners had between 3 to 22 years of game design experience in a professional capacity at the time of the study. In addition to this, and due to the nature of games as a diverse discipline, perspectives ranged from AAA to mobile, casual to indie and even artistic practice. Game design lecturers had between 5 to 27 years of experience and represented different career stages. They had also worked in a variety of higher education institutions from both technical and more academic-focused universities in Ireland and the UK.

For the student study, convenience sampling was used to generate rich data in relation to the game design classroom. Within approaches such as educational action research, convenience sampling is often used (Tomal, 2010). In convenience sampling "*participants volunteer to participate in the research study*" (Gill, 2020, p. 580). In this phase the participants were game design students about to undertake a design project. Tomal (2010) suggests that an issue with convenience sampling can be a lack of generalisability of findings, but given the nature of the research paradigm as constructivist, this aligns with the overall goals of the research. In this case, the goal is to provide a rich account of student learning in the game design classroom and to describe this sufficiently so that the reader may consider transferability to their own context. The following sections will describe the interview and observation methods employed within the research.

3.4.4 Methods

Within this research project, two methods were employed: interviews and observation. Interviews focused on getting professional perspectives from game design practitioners and educators. Observations aimed to gather naturalistic data relating to game design learning in

the context of higher education. Table 3.3 below shows the different methods employed for each phase of the study.

Table 3.3 The methods employed through each phase of the descriptive study.

	Interviews	Observation
The Practice of Game Design	Practicing Game Designers	
Structuring Game Design Learning	Game Design Educators	
Experiencing Game Design Learning		Fieldnotes, Development Logs, Games
Supporting Game Design Learning		Fieldnotes

Interviews

The first method employed within the research was the use of semi-structured interviews (Drever, 1995). Interviews were selected as a method as they closely align with the overall qualitative approach to the research and provide the opportunity to gain unique insights into the processes employed in game design (Robson & McCartan, 2016). As a research instrument, interviews allowed the researcher to understand the perspectives of the participants (Mann, 2016). In semi-structured interviews "*the questions are open-ended and the wording and sequence may be tailored to each individual interviewee and the responses given, with prompts and probes*" (Cohen et al., 2017, p. 511).

Interviews were conducted both in person and online over Skype (Skype Technologies, 2019), Microsoft Teams (Microsoft Corporation, 2022) and Discord (Discord Inc., 2021); all interviews were recorded in OBS Studio (Bailey, 2022) to allow for transcription prior to analysis. The semi-structured interview approach allowed the discussion to provide additional

insights from the interviewees. The interviews took between 20 minutes and 80 minutes, with an average of approximately 46 minutes.

The initial phase of the study involved interviews with practising game designers. Five different designers were interviewed using the protocol that was developed following the literature review (See Appendix C: Interview Protocols). These interviews were analysed using qualitative methods to create a rich understanding of the data (Saldaña, 2016). The second phase of interviews took place with game design educators. The protocol was modified (See Appendix C: Interview Protocols) to account for the perspectives of educators and to consider how they might approach teaching game design. Pseudonyms were applied to all participants to maintain anonymity. The goal of this phase of interviews was to identify how educators structure game design learning and the approaches educators use within game design programmes. For the next phase of research, the method used was observation to gain a deeper understanding of the student design context.

Observation

This phase of the project involved observing the student design process during a game development project. It was conducted as a participant-observer where I as the researcher maintained fieldnotes of the student design process from classroom observations. This methodology was chosen as it can "*provide a context for understanding data collected through other methods*" (Mack, 2005, p. 16). According to Musante and DeWalt (2010) observation is a way to "*collect data in naturalistic settings by ethnographers who observe and/or take part in the common and uncommon activities of the people being studied*" (p. 2). As a lecturer, the goal was to collect data from within the classroom in order to better understand the game design learning process.

The observation data was gathered in the form of fieldnotes while this project was ongoing as well as development logs (DevLogs) that the students published on itch.io while

developing their games. The students were required to complete reflective DevLogs on itch.io as part of their development process. The fieldnotes were completed outside of class time and as soon as the class session finished. Each fieldnote was assigned a unique identifier tied to that class session and did not include any information which could identify individual students. The content of the fieldnotes included setting, participants, classroom interactions and critical reflections (Phillippi & Lauderdale, 2018). The following section will discuss how the data was recorded and stored.

3.4.5 Data Recording and Storage

The data presented in this thesis was recorded as appropriate to each phase of the research. For in-person interviews, consent forms were provided on paper and signed by the participant to confirm participation. Interviews were recorded with a laptop and iPad simultaneously to avoid data loss. Following the interviews, once the laptop recording was confirmed to be complete and without data loss, the iPad recording was immediately deleted. Online interviews took place using video conferencing tools available to participants: Skype (Skype Technologies, 2019), Discord (Discord Inc., 2021) and Microsoft Teams (Microsoft Corporation, 2022). At the start of the call, the consent form was emailed to the participant to sign during the interview. All interviews were recorded using OBS Studio (Bailey, 2022) to capture the audio. Research memos and fieldnotes were created throughout the research as new insights and reflections emerged. The DevLogs from Itch.io (www.itch.io) were copied into Microsoft Word documents and saved to ensure a record of that data was kept. Finally, all the student games were downloaded and stored in Zip files.

Given the large volume of data generated on the project, it was important to ensure that it is handled appropriately. Firstly, all physical materials, such as completed consent forms, were kept in locked storage in TU Dublin. All digital materials were stored on an encrypted external hard drive. Digital material included consent forms, interview recordings, copies

of student DevLogs, games and fieldnotes. The encrypted drive was also held in the same locked storage area. No data breaches occurred during this research. Data will continue to be stored securely in line with TU Dublin data protection requirements (TU Dublin, 2022). All research data was anonymised prior to storage except for consent forms. During the entirety of the research, I was the sole owner of the data, and no other party had access to the data. All devices used to record and/or handle data (TU Dublin laptop and iPad) are encrypted. Data generated during the research will be held for two years after the completion of the research project as per the TU Dublin policy on Documenting Results and Storing Primary Data (TU Dublin, 2022). The following section will discuss how the data gathered was analysed.

3.5 Thematic Analysis

This section discusses the data analysis techniques employed in moving from the data to the findings. Moving from data to findings can involve different approaches that can depend on the theoretical perspective of the researcher. Thematic analysis (Drisko & Maschi, 2016) was used throughout this research project. Drisko and Maschi describe thematic analysis as "*a family of research techniques for making systemic, credible, or valid and replicable inferences from texts and other forms of communication*" (p. 7). A thematic analysis aims to identify significant or interesting patterns, known as themes, within the data, and utilise these themes to address research questions or provide insights into a particular issue (Maguire & Delahunt, 2017). It goes beyond mere data summarisation, as a well-executed thematic analysis involves interpretation and comprehension of the data to derive meaning from it.

Thematic analysis was preferred over alternative approaches, such as grounded theory, for several reasons. Grounded theory, while valuable in many research contexts, presented a number of concerns for this research project. In the context of this study, the aim is not to construct a single overarching theory but rather to explore and understand game design

learning. Thematic analysis allows for a more open-ended and exploratory approach, which better suits the research's objectives.

In addition to this, early proponents of grounded theory such as Glaser (1998) warn against the influence of preexisting knowledge on the development of grounded theory. While other proponents of grounded theory acknowledge the role of existing knowledge in grounded theory they also caution that this can still influence the theory that emerges (Charmaz, 2014). In the context of this research, involving game design practitioners, educators and students as co-theorists could inadvertently influence the theory due to my role within the research. Thematic analysis allowed me to maintain a more objective stance in the data analysis and limited my own insider influence.

The forms of logic that researchers employ can be either deductive, inductive, or abductive (Timmermans & Tavory, 2012). Deductive logic can provide verifiable truths if the premises are correct. Deduction begins with a rule (e.g. all video games require player input) and proceeds to a case (e.g. Super Mario Bros. is a video game) to arrive at a result (Super Mario Bros. requires player input). For the outcome of deductive reasoning to be correct, all premises must be true. Inductive logic involves the formation of a conclusion based on a number of observations. It starts with a number of observed cases (e.g. all the games I've played require player input) to arrive at a rule (e.g. all video games require player input). The outcome becomes stronger as more cases are observed but don't build conclusive proof (Timmermans & Tavory, 2012).

Abduction involves the studying of facts and the generation of theories based on them. Abduction starts with the consequences and then constructs the reasons. It is the process of "*forming an explanatory hypothesis*" (Peirce, 1974, p. 171). Charmaz suggests that grounded theory "*begins with inductive analyses of data but moves beyond induction to create an imaginative interpretation of studied life. We adopt abductive logic when we engage in imaginative thinking about intriguing findings and then return to the field to check*

our conjectures" (Charmaz, 2016, pp. 137-138). This research follows the process outlined by Charmaz above of analysing the data inductively to uncover new insights about game design learning and applying abduction to the generation of potential supports. The following section describes the specific approach taken to the thematic analysis within this thesis.

3.5.1 Transcribing Data and Familiarisation

Interviews were transcribed manually by playing the recordings at a reduced speed (Normally 0.5x speed) while typing the transcript. A manual transcription approach was adopted due to various accents among participants and audio quality issues. The manual transcription process also aided with data familiarisation when reading back over transcripts later. For the student games produced in phase 3 of the fieldwork, I first read the student DevLogs, and my classroom observations to familiarise myself with the data. Following this, I played the games and took additional fieldnotes to capture aspects of the design that were relevant to the study. Prior to analysis, I read over the data relevant to each phase of the research, such as transcripts, student DevLogs and fieldnotes. This process aided in terms of my familiarity (Maguire & Delahunt, 2017) with the data, and I started to create memos of emerging insights throughout this phase. Once data was in a format that facilitated thematic analysis, I moved into coding the data. Saldaña describes the qualitative coding process as including first cycle coding methods and second cycle coding methods (2016). The first cycle codes are used to analyse the data in a systemic manner, while the second cycle methods can aid with the organisation and analysis of the data.

3.5.2 First Cycle Coding

Within qualitative research coding is a common approach applied by researchers to make synthesise data. A code is "*a name or label that the researcher gives to a piece of text which contains an idea or a piece of information*" (Cohen et al., 2017, p. 668). All files

were initially coded using the qualitative data analysis software Nvivo 12 (www.lumivero.com/products/nvivo). For each study, a folder was created, and as the files were coded, new nodes were generated corresponding to the initial codes. Features such as code highlighting and stripes were utilised to identify the frequency and types of codes created. Where I encountered aspects of interest with codes or patterns in the data I created new memos within Nvivo 12. Within this research, two forms of first cycle coding were applied: in-vivo and line-by-line coding.

In-Vivo Coding

In-vivo coding involves capturing words or phrases within the data that are used by the participants themselves (Saldaña, 2016). When coding in-vivo, the researcher must become familiar with the tone and significance that the participants place on certain words. Figure 3.2 provides an example of in-vivo coding from the game designer interviews.

But one asterisk is that we had talked about the concept a lot before that, we didn't have it completely worked out, it's not like we had a complete design bible or anything like this. But we had spent a lot of time kind of just thinking about how it would work. By time, I mean, calendar time[1], not so much dedicated work time, because we were working in other studios, but I think there's definitely some problems that can't really be solved with hours, they have to be solved with calendar time of just thinking about it.

[1] "CALENDAR TIME"

Figure 3.2 A sample in-vivo code highlighting the code of "*Calendar Time*" as a significant concept for this designer.

In this example, the designer discusses the significance of having "*calendar time*" when developing their game. The in-vivo code chosen to represent this statement was "*CALENDAR*

TIME". This term was chosen as it captures the concept "*from the actual language found in the qualitative record*" (Saldaña, 2016, p. 105).

Line-by-line Coding

The other first cycle coding technique employed was line-by-line coding which can "*help you see the familiar in new light*" (Charmaz, 2014, p. 55). This was particularly beneficial in the student study as I was very close to the data gathered, having taught the students throughout the semester. Line-by-line coding helped to move away from preconceptions to a focus on the data. Figure 3.3 provides an example DevLog passage that was coded using a line-by-line approach.

I was in charge of making the player controller which I wanted to be grid based.[1] *Making it grid based created a lot of issues that had to constantly be fixed. Many clipping issues and the player getting stuck on walls and not being able to progress were worrisome.*[2] *In the end we managed to fix the major issues together.*[3] *Now the main reason I insisted on grid based movement was due to certain puzzle that in theory would work better on a grid system however unfortunately these puzzles were cut out due to time constraints and issues with implementation.*[4]

[1] Setting personal goals

[2] Encountering unexpected issues

[3] Resolving technical issues, Working as a team

[4] Decreasing scope

Figure 3.3 A sample of line-by-line coding highlights multiple codes emerging from a short DevLog extract.

The above extract highlights the benefit of a line-by-line approach where four themes emerged that explored different aspects of what the student was communicating. It helps to capture a depth of information around a familiar topic and to view it in a new light (Saldaña, 2016).

Once all data was coded, initial concepts started to emerge within my memos. However, to understand the relationship between the codes, second cycle coding was conducted (Saldaña, 2016).

3.5.3 Second Cycle Coding

Axial and focused coding were both methods employed in the research to help organise and understand the themes emerging from the data. To conduct axial and focused coding, the codes were exported from Nvivo 12 to Microsoft Excel and printed out before being cut into individual strips of paper. On a large table, the codes were grouped together where they related to similar concepts.

Focused Coding

For the practitioner and educator data focused coding was used to develop categories out of the large volume of codes. When applying focused coding the researcher "*searches for the most frequent or significant codes to develop the most salient categories in the data corpus*" (Saldaña, 2016, p. 240). Figure 3.4 provides an example of a category that emerged through the focused coding of the educator interviews.

The category "*FOCUSING ON A PROCESS*" emerged from numerous interviewees and was a way to capture key aspects of how they viewed the importance of the overall game development process in the acquisition of game design expertise.

Axial Coding

An axial coding process was conducted on the data from the student study. Axial coding aims to "*link categories with subcategories and asks how they are related*" (Charmaz, 2014, p. 109). Axial coding was performed by grouping design activities as per Strauss and Corbin (1990). Figure 3.4 provides an example of the axial coding that was conducted for the student study.

The axial coding helped to produce an understanding of the design process and led to the high-level themes discussed in Chapter 6 (Experiencing Game Design Learning).

Category: FOCUSING ON A PROCESS

- *by the third or fourth time they are feeling more confident*
- *full process*
- *it all comes down to the process*
- *it's also process focused*
- *process is important*
- *show iteration, experimentation, research and some sort of collaboration*
- *take students through a certain pipeline*
- *take time to go through a process*
- *the process that we're asking them to follow*
- *they've spent so much time going over the same process*
- *this is the process that you go through*

Figure 3.4 A sample of focused coding highlighting how the theme of "*FOCUSING ON A PROCESS*" emerged from related codes.



Figure 3.5 Axial coding conducted using Post-it notes and line-by-line codes.

After the completion of the second cycle coding process, the analysis focused on reviewing and refining the themes that had emerged.

3.5.4 Reviewing and Refining Themes

Following the second cycle of coding, I reviewed the themes and applied code mapping to develop an understanding of the relationships and theoretical constructs within the data (Saldaña, 2016). Figure 3.6 shows an example of the code mapping process where related modes of design were gathered within the theme of *DESIGN APPROACHES* while *CYCLES OF IMPLEMENTATION AND ITERATION*, and *COMMUNICATION AND COLLABORATION* captured other factors affecting the design process.

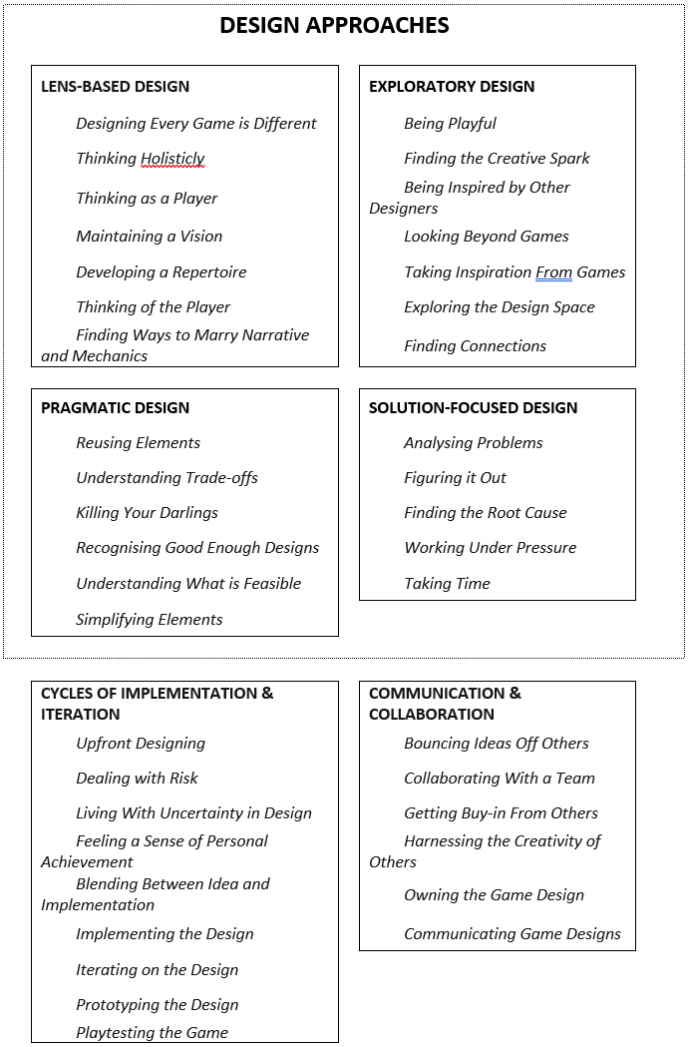


Figure 3.6 Code mapping of the data from the practitioner interviews helped to identify the relationships between concepts.

The code map was then refined further into the theoretical model proposed in Chapter 5 (Structuring Game Design Learning). The process of reviewing and refining themes involved considering how the themes reflected the data, how coherent the themes were, and how distinct each theme was. This process allowed the themes to be refined to communicate the findings clearly and to be grounded in the data. This refinement of themes also led to the identification of sub-themes; for example, the theme of *DESIGN APPROACHES* includes four sub-themes. The sub-themes of lens-based design, exploratory design, pragmatic design, and solution-focused design emerged from the data under the DESIGN APPROACHES theme. These sub-themes explored specific approaches that the designers discussed employing in their practice. Throughout this process, memos were used in order to capture insights into the data and referred to during the refinement process to provide additional insights into the data.

As outlined in Section 3.3.2, Chapters 4, 5 and 6 constitute a cohesive and interconnected segment of the research. Given their integration within the same research framework as part of the descriptive study, the reiteration of themes derived from the thematic analysis across these chapters serves the purpose of reinforcing the consistency and continuity of the research narrative. The thematic analysis provides a thread that weaves through these chapters, allowing for a deeper and more comprehensive exploration of game design learning. This approach aligns with the intent to present a unified study, ensuring that the themes identified in earlier chapters carry forward and contribute to the evolving understanding of the research topic, thereby enhancing the overall coherence of the thesis.

3.6 Conclusion

This chapter has presented the methodological factors related to this research project and provided details on the overall approaches employed. It began by outlining the constructivist paradigm that the research was carried out through and the impact of the theoretical perspective on the research. It then outlined the nature of the qualitative inquiry and

discussed the approach to ensuring quality and rigour in the project. The DRM methodology was discussed, and its relevance to the structure of the research and the nature of the study was provided. Following this, the details on data collection and thematic analysis were presented to provide a detailed account of how the research was conducted. The following fieldwork chapters provide additional information on how the methodology was implemented and the findings uncovered throughout the project.

Chapter 4

The Practice of Game Design

This chapter presents an interview study with practising game designers. While game studies is an emergent research field there is a growing acknowledgement of a gap within the existing literature concerning the practice of game design (Kuittinen & Holopainen, 2009). As a result, there is the potential for a gap within game design education to emerge between the processes employed by game designers and instructional approaches. The main focus of this phase was to draw together the experiences of professional game designers to better understand the processes employed in professional contexts. Through semi-structured interviews and thematic analysis, several key themes emerged in the designers' responses that helped shape the research.

The goal was to gain a deeper understanding of the process employed by game designers and how this relates to both industry and academia. The study involved semi-structured interviews with game designers. The interviews were analysed by applying in-vivo coding before identifying categories, themes, subthemes and a conceptual map to understand the findings that emerged through this process.

The chapter begins by providing an overview of the research objectives, followed by an outline of the specific research design employed for this study. It then presents and discusses

the findings and concludes by discussing the significance of these findings and the direction for future research.

4.1 Objectives

The objective of this phase was to answer the research question:

> *RQ 1: How do practising game designers describe the nature of their design process?*

The goal of this phase was to conduct empirical research to understand, in the words of the participants, how they described the game design process.

The research presented in this chapter forms part of the descriptive study as outlined in Figure 4.1. It establishes the initial themes that will be further elaborated in the subsequent chapters to develop an understanding of game design learning. These emerging themes, identified through thematic analysis, explore how game designers conceptualise their design process and designerly activity within their game design practice.

4.2 Research Design

To answer this question a series of semi-structured interviews were conducted both in-person and online. A total of 5 interviews were conducted with practising game designers. The interviews took an average of approximately 48 minutes per designer. Table 4.1 below provides an overview of the research participants in this study.

The experience is listed as an approximate value as many participants described designing games early in childhood and throughout their lives. The *Years of Experience* attempts to capture years spent focused on game development in professional contexts. Similarly, many of the participants who were interviewed in relation to professional design experience also had

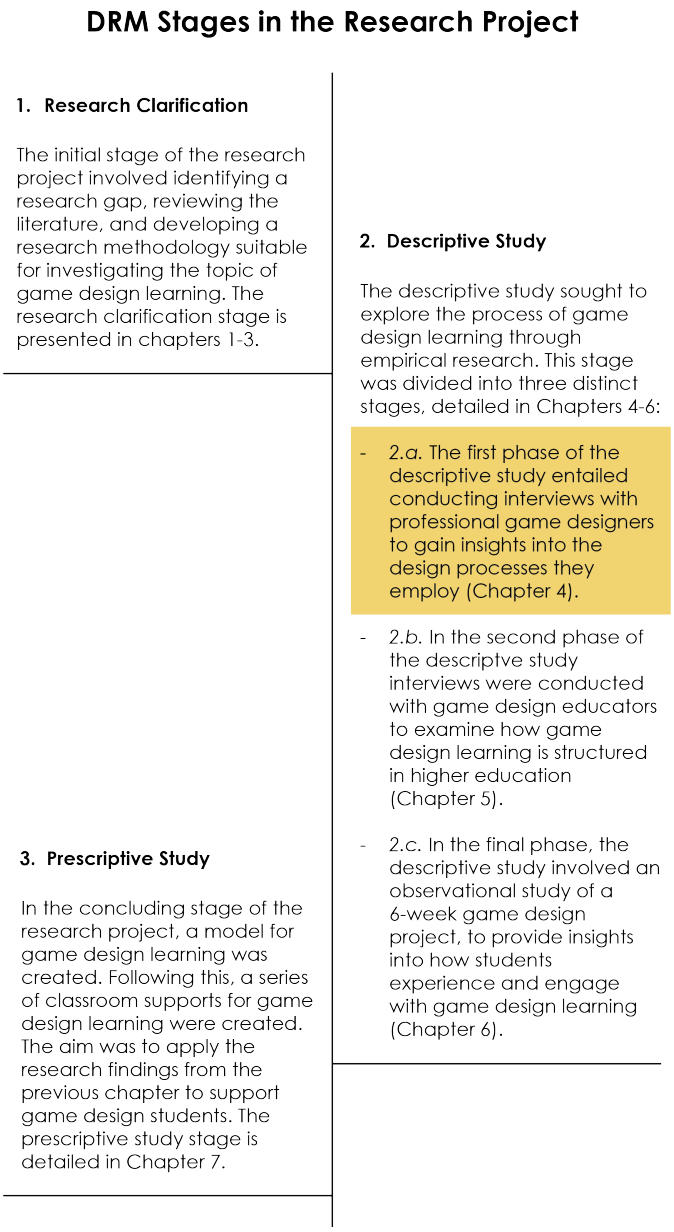


Figure 4.1 The research presented in this chapter is the first phase of the descriptive study conducted.

some experience with game design education. While specific job titles varied considerably the term *designer* is used throughout this chapter as this is the primary area of interest for this phase of the research. The designers worked at various studios, from AAA to indie developers and artists. The participants were based in Ireland, the US and Canada at the time of the interview. For reasons of confidentiality around industry practice and to ensure that

Table 4.1 Participant ID, experience and job title of game designers interviewed

Participant ID	Approximate Years of Design Experience (At time of interview)	Job Title
Bobby	3	Game Designer
Evan	22	Game Designer
Thomas	14	Design Director
Lisa	11	Creative Director
Carrie	13	Game Design Consultant

interviewees felt comfortable discussing their process openly participant names, genders and employer details have been omitted. In addition, the quotations have been anonymised to remove direct references to games the designers worked on.

By considering the designers as a cohesive group, the study can effectively examine commonalities and patterns in their experiences and practices within the context of game design. This grouping allows for the identification of overarching themes and trends in the design process. Analyzing designers collectively offers the advantage of synthesising insights and extracting broader theoretical implications, which might have been diluted if treated as individual cases. This cohesiveness enables the research to unearth underlying principles and practices that contribute to a more comprehensive understanding of the game design process.

The interviews were manually transcribed and coded in Nvivo 12 firstly through an in-vivo approach as outlined by (Saldaña, 2016). The initial codes were then used to generate categories to capture higher-level concepts within the process. A total of 268 in-vivo codes were identified, which led to the formation of 43 categories (See Appendix D: Game Designer Qualitative Coding). A code mapping process was followed in order to identify emergent themes within the data (See Appendix D: Game Designer Qualitative Coding) with three

high-level themes emerging: *Cycles of Implementation and Iteration*, *Design Approaches*, and *Communication and Collaboration*. The theme of *Design Approaches* included four sub-themes corresponding to the distinct nature of the design approaches employed by the practitioners. The following section will discuss the findings from this phase of the research.

4.3 Findings

The analysis of designer interviews led to the development of three themes: Cycles of Implementation and Iteration, Design Approaches, and Communication and Collaboration. Given the complex nature of the game design process, it is worth noting that all three themes are interrelated, as outlined in Figure 4.2.

At the core of the process described by all the game designers interviewed was a process of implementation and iteration where ideas are implemented, the design can be understood, and the impetus for further design is often generated. When designers are actively in the mode of designing, a variety of approaches were identified:

- *Exploratory Design:* An open-ended approach to design, highly creative and less constrained than the other approaches identified.
- *Solution-Focused Design:* An approach to design focused on understanding and solving problems within the design.
- *Pragmatic Design:* An approach to design often enforced by time pressure or constraints where designers must remove, reuse or simplify features.
- *Lens-Focused Design:* This approach to design focuses on viewing the design through different lenses such as the player, genre or designer.

These approaches are not discrete steps or stages of the process but rather ways in which designers approach the game design process using individual or combinatory approaches.

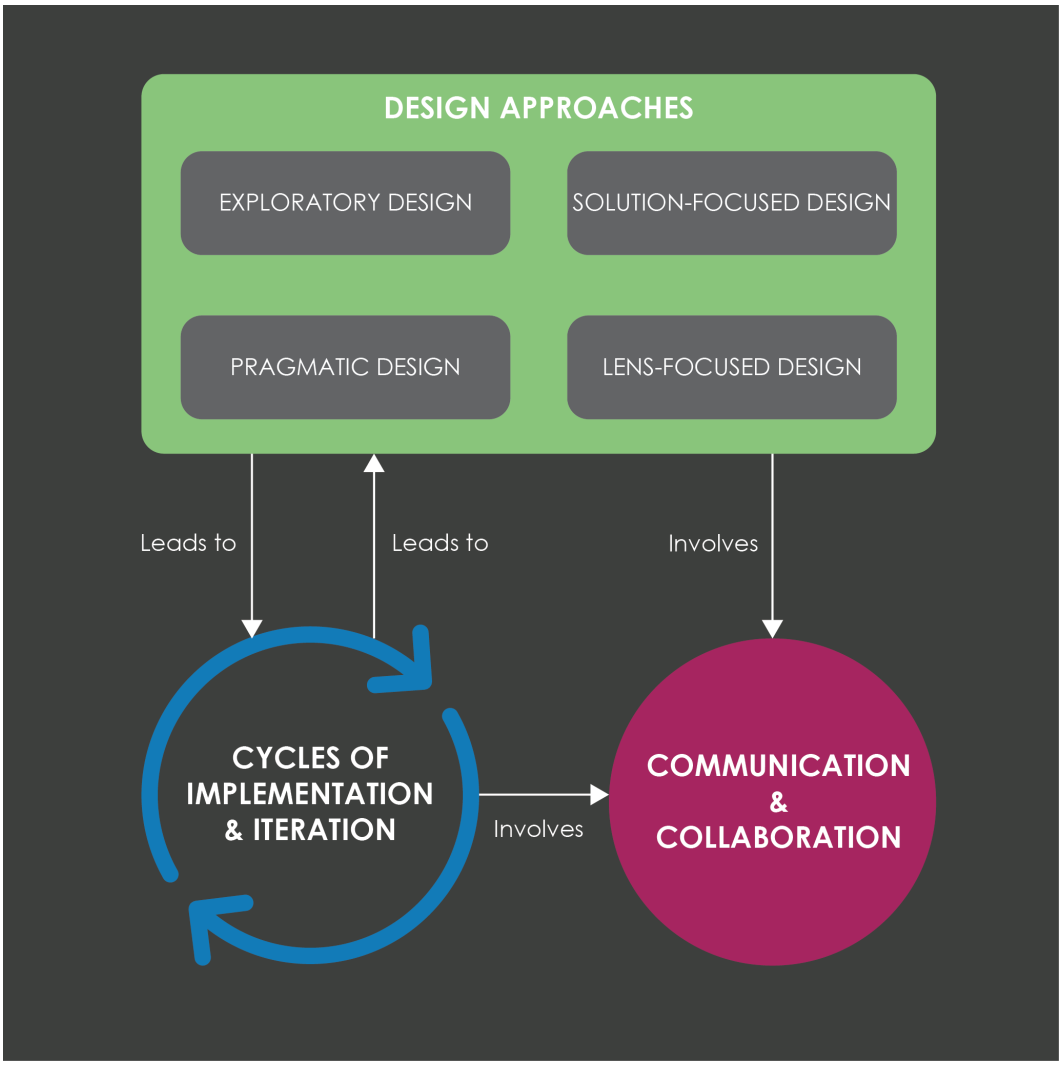


Figure 4.2 Framework of the Design Process Based On Interview Analysis. The framework highlights cycles of iteration and implementation as the core of the game design process, with designers using a variety of approaches mediated through communication and collaboration.

Finally, the process designers discuss is often mediated through communication and collaboration. Even designers who work independently discussed the value of talking to other developers and having someone to provide critique, even if not formally team members or contributors. Communication and collaboration played a major role in the process for the designers working with teams as ideas were discussed and built upon in a collaborative process.

The following sections will discuss the themes outlined above and include quotations from the interviewees to provide a richer context to the data.

4.3.1 Cycles of Implementation and Iteration

As discussed in Chapter 2 several researchers have highlighted the iterative nature of the game development process (Berg Marklund et al., 2019; Fullerton, 2019; Lemarchand, 2021). For the practitioners in this study, many conversations on the design process came back to discussions of implementation and iteration. Firstly, implementation was often seen as the way to externalise design and move from a hypothetical game to something that could be interacted with. Bobby below describes how they conceive of the design in their head but that the implementation is a way to test whether the game will work or not.

> *I think every designer thinks that they can do it in their head and figure it out. And as you get better with design, you can... to a certain extent, but you always... you always have to implement, I think you always have to implement a test because you have no confirmation otherwise.*
>
> (Bobby)

This sentiment is echoed by Lisa, who highlights implementation's importance in identifying if designed elements will function as desired. The implementation for game designers becomes a way to see how the game will function when in play.

> *Implementation is the experience and you can't know how something is going to work until you implement it but the same idea might work in a slightly different context.*
>
> (Lisa)

Later in the interview with Lisa, an example of how this relationship between upfront design and iteration plays out in practice helps to illustrate the challenges and opportunities presented within the cycles of implementation and iteration.

> *We have like a really good programmer now too, so we end up implementing stuff. He wants, like, 'oh, this is exactly how it's gonna be, give me the list'. But you can't do that, until you see how it is, especially with the more weird and experimental mechanics there are. So we're doing like a mechanic now, where you're switching perspective and stuff all the time [...] So when you do that, if you just switch to this camera, the camera is looking around in places. So we need a command to make the cameras look to whoever speaking before you jump into them and all this kind of stuff. And its through implementing it that you can see what works and what doesn't work. You can definitely imagine some of it but implementing it is good.*
>
> (Lisa)

It is interesting to note here the focus on implementation in comparison to other design disciplines. While prototyping is at the core of much designerly activity within game design, the implementation appears to have a more significant role in the process. While product designers might spend large amounts of time sketching, model making and rendering their designs, it appears from the discussion with game designers that the relationship to their products is more direct. This can be seen in the integration of game design within the entire development process. In the quote below, Thomas discusses how they must think through potential future implementations of a system to future-proof the design for further iteration.

> *I think the building and integrating is just so key and so when I'm designing systems up front, what I try to do is build them in a modular way, such that they're somewhat future-proof. Because I'll say 'you know what, I don't know what the answer is right now. But I suspect it's going to be this, this or this. So let's build a system that can accommodate that and then we'll figure out exactly what works best later.' Embracing the fact that you can't know everything up front, but at the same time it's your job to figure things out and not just go 'Oh, yeah, we'll figure it out when we get there.'*
>
> (Thomas)

Of particular note from Thomas here is that they are designing for iteration and to facilitate potential future design flexibility. In this case, the nature of the iterative process creates a design challenge for the designer as they must consider the impact of future iterations. Carrie acknowledges similar concerns in their work from a narrative design perspective.

> *...in narrative games, things are a bit different because it's harder to iterate. So that's why a lot of the prep work has to come at the beginning. Then you decide things and then you have to be really smart in leaving room for iteration because otherwise it becomes very painful.*
>
> (Carrie)

Carrie, below, acknowledges the challenge this poses with the creative aspects of the process and cautions that a focus on implementation can lead to designers losing some of the creative aspects of their designs.

> *And at times, the problem with focusing on implementation is that we can lose sight of what the idea is.*
>
> (Carrie)

Carrie in particular, highlights the relationship between the initial or upfront design and the role of implementation. In this case, she primarily works with narrative-focused games and sees the initial design as being more significant within this genre. While many textbooks highlight the importance of iteration within the process, this may look different for certain types of games.

> *... you see other people who have prototypes and they're iterating. And they have like levels and they change one thing and the game gets a bit better. But you cannot do that in many story driven games because if you change the story, you change the technology, if you change one thing, you change the others, like if you change the design, you affect the story. So it's way harder to iterate and it's just agony. Mostly because if you're working with other people or you're given a specific set of deadlines, your milestones need to be different, they need to be set differently and it was a struggle. So yeah, I am speaking about narrative games, I'm sure the different genres also have different ways of being designed.*
>
> (Carrie)

Another challenge with the iterative nature of game development experienced by the designers is how it fits within their production constraints. Lisa below describes their development process and how iteration and constant refinement can take place over months on a project. In this case, they highlight the iterative nature and the challenges it poses from a production perspective.

> *... we'll have a version of a mechanic or a version of the story, or even with our current game we went through like a lot of iteration on the art styles, which changed a lot. We will come up with the solutions that we think are best and we will make this demo and stuff and it's is really cool and then we're working on the rest of the game now. Then slowly over time this uncomfortableness level and my like 'I don't think that's good enough' or 'I don't think it works' or like 'shit! somehow we ended up copying Call of Duty and we're making a world war two shooter and how did that happen', and so I will go into these kind of like dark nights of the soul where I'm like 'fuck, it's all terrible, it's all shit'. And then I will struggle in that place for a bit and then come up with this new solution that does the Miyamoto thing, or does the whatever, it solves all these problems at once and then that will spark off all of these new ideas and the whole game will be refreshed, and then we'll go from there. Then three months later it's like 'Oh I still don't think it's good enough anymore or something'. So it's these phases of coming up with a solution, the bigger solutions, and then the results of it, and then growing unease of it not working. Which is terrible from a production point of view.*
>
> (Lisa)

This shows how the designer grapples with the quality of the game over the cycles of implementation and iteration. It also corresponds to the suggestion by Carrie that focusing on implementation can lead to 'losing sight of what the idea is'. One factor that impacts the cycles of implementation and iteration in game development is time. Below, Thomas highlights the need to think through problems and the role deadlines play in reaching a design solution.

> *I think sometimes you need calendar time to just get familiar and just kind of steep yourself in the game. But then weirdly, sometimes deadlines are extremely helpful. Because there's cases where it can and should take a long time. And there's cases where really, it should be done quickly. Because if you don't, if you don't have a deadline, then sometimes what happens is, you just live purely in the realm of possibility. We could do it like this, we could do it like that and you never have to push any of those ideas to completion, and therefore you never are able to determine whether they work.*
>
> (Thomas)

The nature of the game design process as iterative cycles of implementation and iteration lead to designers having to consider which problems should be solved now and which should

be solved later. 'Calendar time', as outlined by Thomas above, is the process of taking time to think through design problems while the deadline requires a solution to be found. This relates to other design disciplines and the concept of *Wicked Problems* (Buchanan, 1992). Game designers must therefore use their experience to prioritise the problems they encounter in their work.

This section has focused on the iterative process at the core of the process employed by the designers interviewed. In particular, it identifies the centrality of implementation and iterative cycles to evaluate and understand the game in development, unlike other design disciplines where design modelling is more commonly practised. The challenges of working within an iterative process were also highlighted, with design and implementation requiring the consideration of future configurations for the game design. Finally, it considered the personal and production challenges of working within this cycle. The following section will provide an overview of the design approaches that game designers employ within this process.

4.3.2 Design Approaches

This section describes various approaches that designers employ within the game design process. Each process is not a single isolated procedure applied in a prescriptive manner but is rather an approach used in the context of the game development process. The approaches were categorised into four unique categories based on the thematic analysis of interview transcripts: *Exploratory Design*, *Solution-Focused Design*, *Pragmatic Design*, and *Lens-Focused Design*. The following sub-sections will provide an overview of each design approach and include extracts from the interview transcripts to highlight how designers employ them in practice.

Solution-Focused Design

Within the design process described in the interviews, a theme that emerged was a focus on design as a problem-solving activity. In the solution-focused approach, designers attempt to solve design problems, similar to problem-solution framing within the wider design literature (Dorst & Cross, 2001). Below Carrie describes this as part of the fun of the game design process.

> *I think that one of the constants in my life is I like puzzles and solving puzzles, and a lot of game design, even narrative design is puzzle solving, right? You have a problem, and you have to come up with a solution and I think that that's the fun part.*
>
> (Carrie)

For this designer, the puzzle-solving and solution-focused nature of game design is at the core of being a game designer. The problems the designer encounters are seen as puzzles to be solved, and the designer is the one who is best placed to generate those solutions. This sentiment is echoed by Lisa, who highlights the problem-solving nature of game design and the value of solutions that solve multiple problems at once.

> *Game design is solving problems and it's very easy to come up with a solution to a problem, to a single problem. But if you can come up with a solution to a problem that solves 10 other problems, and then that gives you all these other ideas, that's when it's awesome. I think it was [Shigeru] Miyamoto who said a good game design is one that solves multiple problems at once.*
>
> (Lisa)

The concept of a game design solution that solves multiple problems at once is attributed to Shigeriu Miyamoto, the designer of many popular Nintendo franchises and an industrial designer by education(DeWinter, 2015). Satoru Iwata, the former Global President and CEO of Nintendo, describes how Miyamoto taught him this concept:

> *'A good idea is something that solves multiple problems in a flash.' This is something that Shigeru Miyamoto taught me at Nintendo about making games.*

> *[...] A single breakthrough that will make this thing better, and that thing better. This is the definition of a good idea, and having one will move the project forward, closer to your goal.*
>
> (Iwata et al., 2021, pp.69-71)

Here we see that the role of the game designer is often focused on problem-solving and that a key approach employed by game designers is the ability to generate solutions. Bobby below describes how they try to find the root cause of a problem as it often can solve other issues in the game design.

> *I try to implement solutions for each stage of the problem and starting from what I would perceive to be the root cause moving upwards. Because if the root cause solution fixes it, it probably fixes a tonne of other problems. And if it doesn't, then it may be some other problem.*
>
> (Bobby)

In this instance, the designer is searching for the root cause of the design problem to identify where a solution can be most beneficial. This process of problem finding relates to the co-evolution of problem and solution (Dorst & Cross, 2001), where designers not only consider what the solution to a problem is but also what problem to solve. The solution-focused approach to design is also closely aligned to the cycles of implementation and iteration that were discussed above, as designers identify problems and iterate through solutions within these cycles. Thomas, below, discusses how uncertainty and implementation relate to solution-focused game design.

> *If you're trying to innovate, there's always going to be big unknowns. And I think it's just kind of funny that no matter how experienced you get, there's still that those gut checks that you're just gonna be like, well, let's hope this works. [...] I think so I think as long as you're innovating in some way, the unknown is always going to be there. And that's always a problem that you're gonna have to solve. And I think the best way to solve it is, is prototyping and making stuff no matter how clever you get on the page. There's no substitute for just making and trying.*
>
> (Thomas)

In this extract, Thomas discusses the uncertainty surrounding potential solutions, whereby without experiencing them in the game, they cannot be sure they will work. This designer associates this uncertainty with the relationship between innovation and implementation, where designers aspire to create something new or original but can only fully understand the impact of their designs through implementation. In other words, to be sure that the solution solves the problem, it must be implemented, not just designed.

The solution-focused approach described in this section involves designers acting as problem solvers to uncover solutions to issues within their game design. To do this, the designers must understand the cause of the problems at a fundamental level and the ideal solution for designers solves multiple problems simultaneously. Finally, the solutions the designers develop exist in relationship to implementation, as the effectiveness of design solutions can only be validated through implementation. The following section will look at exploratory design as an approach within the game design process.

Exploratory Design

Exploratory design is a more open-ended and less constrained approach than the other approaches identified below. When designers discussed this approach, they often talked about being creative, playful and trying to create something new. Carrie below describes this drive to create something new and creative:

> *So for me, one thing is like making the game and on the other side what is the spark, what is the joy that you have in making this game, what is the motivation, you know, what is the new thing? And how are you providing a space that is also creative for your audience, your games are not just for yourself they're for other people. So the creation is like an experience and how is this going to be engaging for people beyond you?*
>
> (Carrie)

As discussed in Chapter 2 innovation is an important aspect of the game design process, and this quote shows how the designer wants to bring something new to their players. Similarly, Thomas discusses the importance of doing something new:

> *I think it's totally fine to be to reuse existing systems to be inspired by other games, both thematically or creatively,or you know, mechanically. But you're not being creative if you're not trying to do something new.*
>
> (Thomas)

This echoes what Jónasdóttir and Bygstad (2019) describes as soft innovation within the games industry, innovation in content or bringing something new to players. Throughout the interviews, designers often discussed this approach and the methods they employ. For example, Evan, below, describes the importance of the designer's mindset while in this exploratory mode.

> *Game design, for me, is about figuring out how to design the game. It's very much an exploration and involves seeing where the project and design process take you. [. . .] The internal aspect is to do with the personal openness to being playful, silly, being willing to make mistakes.*
>
> (Evan)

The approach involves following the design process through an exploratory approach to see where it leads. In addition to openness and playfulness, designers also understand what other games are doing. Thomas below describes how they play games to look for sources of inspiration.

> *A lot of research for me is actually playing other games; what's been done before, part of trying to do something new is knowing what is out there, knowing what works. . . I mean, at times, we play something, and maybe I'm the kind of creative person that sees something and gets frustrated but sees that there's something worthwhile and something interesting there and you want to do more of that. So I think that playing games as part of research, and knowing what's out there is kind of essential.*
>
> (Thomas)

This grounding in the discipline of games allows designers to see not just what other games have done well but what they haven't done well but that has potential. Designers, however, also look beyond games within exploratory approaches to design. An example of this is how Bobby looks to architectural theory to solve level design problems within their game and how their background in science helps them as a designer.

> *So a lot of, for example, level design problems I've had have been solved by looking at architecture, and architectural design, the use of negative space and prospect and refuge. So looking abroad has often helped. And with my scientific background as well, just looking at how science, especially physical science solves certain issues helps a lot.*
>
> (Bobby)

While the example of level design has a direct relationship to architecture, it is interesting to note how the designer's scientific background influences their approach. Many designers shared the sentiment that ideas come from varied inspirations. Lisa, below, describes how for them being creative involves being open to seeing new connections; to do that, the designer must seek a diversity of experiences.

> *Basically, creativity in some sense is like something from one domain brought to another domain, or seeing a connection between things that no one else saw before, you know. So you have to increase the chances of you seeing that connection that no one else saw before.*
>
> (Lisa)

Within the field of creative cognition, this concept of finding connections is seen as a key aspect of the creative process (Ward, 2007). Later in the interview, Lisa describes both the importance of grounding within the discipline of games and seeking inspiration from other disciplines.

> *That's why to me being a game maker among filmmakers or a game maker among poets is just so much more enriching and vital than just going to the same GDC talks every year, you know, they have the workshops, and they're good*

> *you need to have that. You need to have that grounding for it first but I think as diverse a set of inspirations as possible and then it's just like, there's like things you can do, you know, like questions you can ask yourself and everything. But really, to me, what's most interesting is when people pull the answers from their own lives.*
>
> (Lisa)

Carrie describes the importance of taking time away from work to be creative as it can lead to new design insights.

> *So taking holidays is really, really good for my creativity because I'm not thinking about it and then you know, you go out and then it's like, there is something that might be an inspiration or like, Oh, yes, I want to make a game about this.*
>
> (Carrie)

The exploratory approach described in this section involved designers being open to creativity, playfulness and new experiences. But they must also have a grounding within the discipline to identify where new connections and insights can be formed. Cultivating a variety of inspirations was seen as important across all interviewees, and often this involved new experiences, travel and meeting other designers/creatives. In the following section, pragmatic design as an approach will be discussed.

Pragmatic Design

A further design approach discussed by the practitioners was pragmatic design. This design approach was often characterised by a rational focus where designers described reusing/simplifying elements, 'killing their darlings', and understanding what is good enough and what is feasible. Thomas, below describes how the role of the designer can be quite pragmatic and sees much of game creation as a trade-off between different factors.

> *I would say, it's your job to understand how every piece of the game interrelates and I believe you should be the one best equipped to understand trade-offs. Because a lot of game creation is about trade-offs, you're not unlimited scope,*

> *you're not [an] unlimited team. So a lot of times, you kind of have to understand, do we double down on this thing? And if we do, how is that gonna affect everything else?*
>
> (Thomas)

This extract shows how the designer must consider pragmatic concerns such as the scope of the project and the capabilities of the team when designing. For Thomas, trade-offs are one of the most important aspects of game design. To him, designers should maintain an understanding of the overall game design and the impact of trade-offs. Expanding on this further, he explains that the design outcomes must be "*good enough*" to achieve the desired outcomes of the project.

> *It doesn't mean you should just be satisfied with anything like, 'Oh, that's good enough'. But what it really means is, 'Is it good enough to fulfill your goal, the mission'.*
>
> (Thomas)

This gives additional insight into the designer as they are trying to choose between the most suitable trade-off and find outcomes that are good enough. This relates to the problem-solving approach and wicked problems (Buchanan, 1992) discussed earlier, as the designer must be pragmatic in finding solutions that are appropriate to the nature of the problems faced. Carrie, below, gives an example from their work of working with a programmer and trying to communicate a pragmatic solution as opposed to an elegant solution.

> *At first we started talking about how that would work and he would have these kind of ideas about implementation using optimisation and all these AI checks, and I was just like 'do you need to do all this?' And I showed him the diagram of what I wanted and he was like 'oh, yeah, that will work. I mean it's not elegant, but it would work'. So it was very funny because for him, it was a very difficult technical problem, because he was looking at it from the side of computer science and on my side, I was just like, 'But this is a design and we can implement this right?' and he realised, 'Oh, yeah', that's not how he was thinking about it.*
>
> (Carrie)

This example gives insight into the role of the game designer as someone who must be pragmatic. This is in contrast to the solution-focused lens discussed earlier, where designers sought elegant solutions that solved multiple problems. In the pragmatic approach, the designer looks for the most efficient solution that will require the least work to achieve their goal. One facet of the pragmatic design approach is a need to cut or remove elements from the game design to improve the overall game, player experience or for production concerns.

> *The kill your darlings thing, you know, that sort of line about writing where, you know, sometimes you have to take your favourite part of the story, or your favourite character, or your favourite part of a character or whatever, and get rid of it. And then you'll find that actually, everything is now working better. That's happened a lot in games that we've done, where you just, you reach a point that you're like 'Wow, this thing that I was so enamoured with and proud of, is actually now the thing that's in the way.' And that's happened enough times now that I'm less and less precious about it, you know, the first time you have to do that it's really painful. But after a while, you kind of realise that that's just part of the process.*
>
> (Thomas)

This extract shows how designers build on the knowledge from other disciplines, drawing on advice from other creative fields to improve their own practice. Of particular note in this quote is the emotional impact of cutting features that may have involved considerable design and implementation resources to this point. This highlights the emotional relationship designers have to their practice and some of the challenges faced when acting pragmatically.

When designers approach pragmatic design, they may also look to re-use elements of existing designs. Bobby below discusses the importance and challenges involved in reusing game elements.

> *In game development and game design, that's a really core tenet that I think is forgotten a lot: reusing mechanics. We're re-using ideas and reusing assets in interesting and different ways, it's actually one of the greatest challenges, which is really interesting.*
>
> (Bobby)

In this extract, the designer describes how they view reusing elements as a central aspect of game design. Hagen (2009) describes this as a process of recycling within the game design process, while Sánchez et al. (2021) describe this as the transformation of different design elements. As such, it represents a way to build on the existing knowledge designers might have to develop appropriate solutions as opposed to investing time into developing completely original design elements.

Lisa, below, also highlights the dangers of not being pragmatic and of focusing on more exploratory or aspirational design approaches.

> *I was an individual developer on [GAME NAME] and I was actually working on a big project that was like 'Oh, this is gonna be great and I have all of these ideas', which is so common; I think you see it with students a lot. There's a danger of a kind of what I call, I mean I should probably come up with a better name for this, but what I call 'a Molyneux idea', which is an idea that in your description of it is signalling that it's great and the idea itself is the interesting part, not the experience of it.*
>
> (Lisa)

This example indicates that designers should try to remain at least somewhat pragmatic with their design process as there is a danger, highlighted here for novice designers in particular, that the idea is more interesting than the game.

The pragmatic approach discussed in this section centres on a design process that is rooted in the concerns of what is possible and achievable. To employ a pragmatic approach, game designers must understand the game design from a holistic approach and be able to understand the consequences of trade-offs. The designers also have to be willing to cut some of their favourite content and be aware of how to reuse elements where appropriate. In the following section, lens-focused design as an approach will be discussed.

Lens-Focused Design

The final design approach that was identified in the analysis was that of lens-based design. This approach to design involved the designers looking at the design process through different

lenses such as the player, technology, genre or their own repertoire. In this approach, designers look to these lenses to develop design solutions. Carrie below describes a number of the lenses that a game designer must consider when working on a game project.

> *Every game is different. Because at times, it can be the technology, like you're working on something, but it has to be mobile, for example. You are working on a game where you have a tight deadline, and that really as I was saying the deadlines really change that. At times like who the audience is, and knowing who the audience is going to be, and who's going to play it does change a lot of how you're designing things, you know, like, you cannot say that you're making a game that is accessible for everybody because it's narrative, and then it has to be VR and you have to use the controller.*
>
> (Carrie)

The sentiment at the start of the above quote was echoed by most of the participants and was viewed as a challenge specific to the game design process. The challenge, however, wasn't always viewed as a negative as designers felt they could bring their experience to different types of games. Lisa, below, describes how they use their experience with different lenses to create a richer experience for the player.

> *Another kind of interesting point on [GAME NAME] actually, as you get to the ending there, another thing that's really important to me is what is the effect of the aesthetics and everything. So to me, game design isn't just the mechanics, it's every element of the game; so how the art and the music and all that comes together. In that final moment of [GAME NAME] you have this really horrible message, but then this very uplifting punk music happens. So there's a total tonal clash there and by having these different tones, it is a richer experience. It's kind of like, there's a lot more to look into. So, rather than every element of your game, like saying the same thing, you're giving it depth by having these different elements, representing different parts of it, so the players are getting like a more 3D experience.*
>
> (Lisa)

In the above quote, the designer highlights how game design isn't conducted purely through the lens of the mechanical game elements but that they also consider the visuals, audio and thematic elements in concert. Another lens applied and mentioned in the above

quotes is the lens of the player who will interact with the game. Evan, below, describes this lens and the relationship between the designer and their audience.

> *The audience interaction in games allows for a really interesting relationship between the auteur and the player. I see game design as creating tools for the audience to interact with and interpret. I find working with an audience inspirational and provides motivation for my work.*
>
> (Evan)

In this extract, the designer sees themselves as designing something for the player to interact with, and this relationship with the audience provides motivation to the designer. The lenses designers employ aren't limited to external concerns but can also involve the repertoire of the designer. Designers often described their preferred genres or types of games, as illustrated by Thomas below.

> *I prefer and enjoy working on strategy games, and that can involve an RPG component although that's not always the case. But really, for me, I think my strength is as a systems designer, so I enjoy strategy and that could be turn-based or elements of real-time involved. But really anything where strategy is the core of the gameplay is where I feel like I am at home.*
>
> (Thomas)

In this case, the designer feels most comfortable designing games in the strategy genre and has been successful in developing games in this area despite having designed for other genres in the past. However, they also describe how their process isn't purely focused on the systemic elements of the game.

> *So that can be a little bit different than like the team process on say [GAME NAME], but my process is usually, despite the fact that I'm a systems designer, I start with the idea, the theme and concept because that's what really excites me, as opposed to starting with a specific mechanic in mind. I like to get really excited about just the topic, because I find the topic then influences and informs what systems would make sense. I think where design really shines is where the theme and the mechanic directly line up and you kind of say 'Oh, well, yeah, like that mechanic makes perfect sense for that theme.' Versus sort of: what a cool*

> *theme, what a cool mechanic, it could have been anything with that mechanic, but it's cool that that themes neat, so that's neat. I try to shoot more for you know, the mechanic really making sense with the theme.*
>
> (Thomas)

This shows how the designer's preferred genre doesn't dictate which lens to apply to the design process; rather they apply the appropriate lens at the appropriate time. For Thomas, this means focusing on a theme and finding mechanics that fit well with that; the lens of the theme creates the focus to allow the designer to identify appropriate game mechanics. The lens-focused design approach discussed in this section concerns designers observing the game through a variety of lenses to conduct design. These lenses varied from components of the game such as audio, visuals and narrative; to look at the game from the player's perspective; and from their own perspective as an auteur.

The sub-themes discussed in this section represent different approaches that the designers employed in their work and highlight the complexity of the approaches. A key concern to reiterate at this point is that these approaches are not exclusive, prescriptive steps but rather descriptive, interrelated and combinatory approaches employed while designing games. The following section will discuss how the final theme of Communication and Collaboration impacts upon and is impacted by the Cycles of Implementation and Iteration, and the Design Approaches within the game development process.

4.3.3 Communication and Collaboration

The final theme that emerged from the analysis was Communication and Collaboration. This theme focuses on two aspects of the designer's role that involve the externalisation of game design practice. Within the design process, communication is seen as a way to capture designs and share them with others through a variety of approaches, and collaboration often involves working with others or even getting input from others not directly working on the

project. The extract from Evan below highlights the significance of communication in the design process:

> *Game design is mainly about communication and visual communication is more valuable than written communication in terms of designing a game. I use sketches and prototypes to ensure that the team are informed about the design.*
>
> (Evan)

For this designer, game design is centred on communication, and that is at the core of their practice. Using visual and written methods to communicate game designs with the team, this designer places communication and collaboration at the centre of their practice. Thomas also elaborates on the role of the designer as not a singular visionary but rather a democratiser of the design process.

> *It's not always about being the most creative one, or, you know, having all the good ideas. I think a good game designer, harnesses great ideas from the team. And shapes them in such a way that it'll work in the greater whole. So, philosophically, I think you just need to understand the game, kind of the best and understand why decisions need made and what the pros and cons are.*
>
> (Thomas)

This quote shows the designer as someone who can harness the creativity of others and consider them in relation to the overall game design. This relates to the pragmatic design lens discussed earlier, as the designer must understand the trade-offs involved in implementing concepts from others on the team. Carrie, below, echoes this sentiment and provides more detail on the role of the designer in a collaborative environment.

> *So for me, it doesn't make sense to be like 'I'm the designer, this is my idea!' The people who say that they don't have game designers [in their studio] or they don't teach game design, I think that that's their idea of what a game designer does. For me its more like; I ask the questions, we come up with a framework and I... you know, I'm part of coming up with a solution, but I'm not alone- its the buy in from the rest of the team that is also important, it's a collaborative effort. So making people comfortable and engaging your team first so that when you make the game, the players are also engaged.*
>
> (Carrie)

In particular, Carrie discusses their role as trying to get buy-in from others and to ensure that the team share the creative vision for the game. She challenges the perception of designers as auteurs and see design as a collaborative effort involving the entire development team. Thomas, below, describes the role of communication in their practice as a way to provide clarity in the game development process.

> *Part of your job as a designer is to harness all the ideas, I think documentation is really somewhat important for that, not in terms of slowing you down- I make the documentation for myself because ultimately I need to be able to explain how something works to somebody. It may be very clear in your head at one point, but you might not have to explain it again for three months.*
>
> (Thomas)

The documentation is used as a repository of design knowledge to aid with communication in future and as a way to harness game design ideas. The specific type of documentation designers described tended to favour flow charts, diagrams and short feature specifications over longer design documents. The below quote from Bobby highlights the benefits of visual communication as part of the collaborative process.

> *If I'm doing a flowchart of trying to design a scenario, we're doing a flowchart of start to finish [...] having design in the room and other leads, each of them lending their own expertise. And we often solve problems long before they show up. Like we're literally doing a paper prototype or digital paper prototype of the flow. And each person sees issues on their production pipeline long before it shows up in the actual game.*
>
> (Bobby)

The flowchart here is used as a "digital paper prototype" not only intended to capture the design of the game but to communicate it and to gather feedback prior to implementation. The documentation, in this case, serves as a way to solve design and development issues before they impact production. The collaborative nature of this process involves the democratisation of design, where other leads can discuss the impact of design decisions on their own disciplines.

Designers also referred to specific collaborators during the interviews. In particular, Lisa discusses the benefit of finding a suitable collaborator below.

> *I think having someone that you can bounce off, like me and [COLLABORATOR NAME], and I had other people before that, but it didn't work out. But with [COLLABORATOR NAME] we both come in with no ego and we're both kind of bouncing ideas off each other. So I think having another person that you can quickly, like, try things out and bounce things off and develop together. Then we have to communicate it to other people on the team and stuff and then drawings between each other, text, all this kind of craic. But I think being able to develop stuff with another person is huge and then communicating it.*
>
> (Lisa)

For Lisa having a collaborator to work closely with on design is a key aspect of their process, and it's evident from the above quote that it took some time for them to find a suitable collaborator. This quote highlights the value and importance placed on the collaborative relationship in game design. Thomas below discusses a long-term collaboration focused on individual abilities in game design.

> *I've been lucky enough on both [GAME NAME] and [GAME NAME], I worked with a fellow designer named [COLLABORATOR NAME], and he was great at [level design]. We were a good team because his strengths really compensated for my weaknesses and the further I've gotten in my career I think it's good to actually accept.*
>
> (Thomas)

This shows how collaboration can emerge over time and lead to a working relationship allowing designers to focus on specific skill sets that complement those of their collaborators.

This section has discussed the role of communication and collaboration in the game design process. The designers themselves place significant emphasis on the role of collaborators and team members in the execution of their work. Firstly, they highlight the importance of communication as a skill within game design and specifically focus on the importance of communication when working with others. They also recognise the significant contributions made by team members and collaborators in their process. This analysis then suggests that

communication and collaboration mediate the approaches the designer employs during cycles of implementation and iteration. It also signifies the importance of collaboration in the creative work of game designers. The following section will provide an overview of the findings from this chapter, the significance of the findings and lead into the following round of fieldwork.

4.4 Conclusion

The objective of this study was to answer the research question:

> *RQ 1: How do practising game designers describe the nature of their design process?*

In conducting the interviews with designers, a framework of the process based on qualitative analysis of the data was developed. This framework situates the cycles of implementation and iteration at the core of the game design process, with the designer approaching design problems through a variety of approaches often mediated through communication and collaboration. This finding leads to the following research contribution:

> *RC 5: An understanding of game design in relation to other design disciplines.*

The interviews provided insight into the design process employed and how designers conceptualise this process. The findings highlight similarities between the game design process and other design disciplines. The modes of designerly activity within the Lawson (2010) design process model are evident in the practice of game designers. Designers described analysis tasks such as playing games, reading books, watching documentaries, exploring nature and numerous other activities that they do when facing a design problem. Designers also described a multitude of ways to synthesise their designs, from sketches, written descriptions and just through discussion to "flesh out" ideas. The designers used

evaluation regularly to identify potential issues and to improve design outcomes. Finally, the designers described game design as a problem-solution-focused activity and often described moving between problems and solutions in their work.

The findings highlight the importance of implementation within iterative cycles and the importance game designers place on being able to interact with their designs. Interestingly this differs from many other design disciplines where sketching and drawing are the core activity of designers (Sturdee & Lindley, 2019). This suggests that within game design the modelling employed has higher fidelity to the final outcome than the forms of modelling in other design disciplines (Andreasen, 1994). Similar to other design disciplines the analysis suggests that iteration is a significant part of the design process for games. The study also provides insights into the modes of designerly thought employed by game designers as they move between solution-focused, exploratory, pragmatic and lens-focused approaches to design. Designers spoke of employing different approaches depending on the stage of the project and the nature of the design challenge. Finally, the study brings to the fore the role of communication and collaboration in the game design process. The designers spoke of the importance of communication when working with others and the importance of having collaborators to design with, as well as harnessing the creativity of the team.

The findings also suggest that game design has its own complexities in terms of how designers approach the game development process and that the game design process can be malleable depending on the needs of the game, the composition of the team and the expertise of the designer themselves. This framework can be seen as a descriptive tool for understanding the game design process and the activities employed in the design of video games. The findings of this chapter provide insight into the nature of the game design process as outlined above and also suggest that the game design process shares similarities with other design disciplines. The study also highlighted unique aspects of game design with high-fidelity implementation being a significant factor in the game design process and the

significant role of communication and collaboration in the process. This study provided insight into the practice of game design in the words of the designers themselves. As the research is focused on the education of game designers, the following chapter will explore the educational processes employed in game design learning.

Chapter 5

Structuring Game Design Learning

This chapter presents the findings from an interview study that explored how educators structure the game design learning process. The previous chapter sought to understand the processes employed in the practice of game design through interviews with practising designers. This chapter follows from that and involves a series of interviews with game design educators exploring their teaching practice and approach to teaching game design specifically. Similar to the previous study, this involved the use of semi-structured interviews and qualitative analysis to generate an understanding of how these educators approached teaching game design.

The goal of this study was to explore the process of game design education and how educators shape that process. The previous study highlighted the central theme of cycles and implementation as the core site of designerly activity. In this study, I sought to understand how this differs in an educational context where the constraints differ greatly from those in a professional environment. The study involved semi-structured interviews with game design educators. The interviews were analysed by applying qualitative coding before identifying categories, themes, subthemes, and a conceptual map for understanding game design education that emerged through this process.

The chapter begins by providing an overview of the research objectives, followed by an outline of the specific research design employed for this study. It then presents and discusses the findings and finally concludes by relating the findings to the previous study and proposes the study of the student process which follows.

5.1 Objectives

The objective of this study was to answer the research question:

RQ 2: How do educators structure game design learning in higher education?

The goal of this phase was to conduct empirical research to understand how educators approach teaching the subject of game design.

The research presented in this chapter forms part of the descriptive study as outlined in Figure 5.1. It builds on the themes uncovered in the previous chapter, investigating the organisation of game design learning by educators within the context of higher education. The themes that arise from the thematic analysis expand upon the game design process previously discussed by practitioners and also shed light on how educators structure game design learning. This chapter further elaborates on the themes developed in the previous chapter to provide an understanding of game design learning within the contexts of higher education in Ireland and the UK.

5.2 Research Design

To answer this question, a series of semi-structured interviews were conducted both in-person and online. A total of 5 interviews were conducted with game design educators. The interviews took between 40 minutes and 55 minutes, with an average of approximately 43

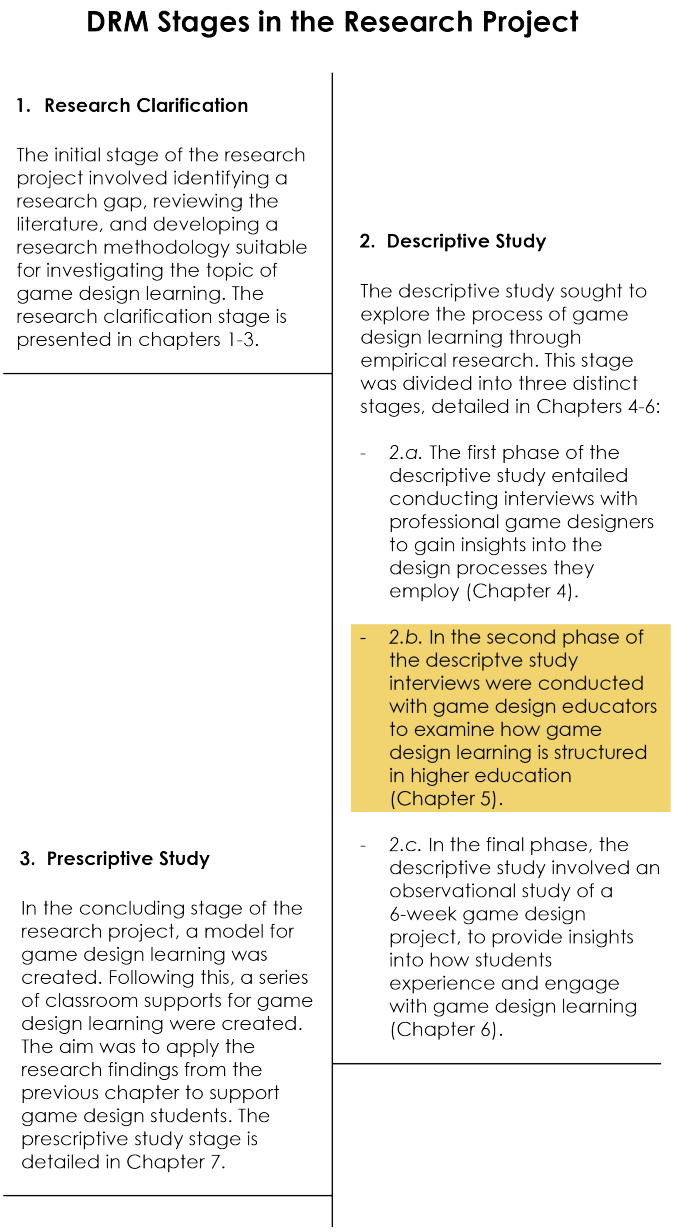


Figure 5.1 The research presented in this chapter is the second phase of the descriptive study conducted.

minutes per interview. Table 5.1 below provides an overview of the research participants in this study.

Educators were selected from Ireland and the UK as the structure of higher education is similar in both countries, and the core focus of the research is on improving practice within this context. The experience is listed as an approximate value as some participants had

Table 5.1 Participant ID, experience and job title of educators interviewed

Participant ID	Approximate Years of Design Experience (At time of interview)	Job Title
James	5	Lecturer
Ben	20	Senior Lecturer
Adam	11	Lecturer
Mia	7	Lecturer
Henry	27	Senior Lecturer

experience in a part-time capacity prior to becoming full-time educators. Similar to the study on design practitioners, many of the participants who were interviewed in relation to design education also had some experience with game design practice. While specific job titles varied considerably, the term *educator* is used throughout this chapter as this is the primary area of interest for the study. For reasons of confidentiality, participant names, genders and employer details have been omitted. In addition to this, the quotations have been anonymised to remove direct references to any higher education institutions.

The treatment of educators as a group facilitated the development of theoretical and analytical insights. This approach enabled the research to focus on the structured aspects of game design learning within higher education, discerning commonalities and differences in their pedagogical approaches. By grouping lecturers together, the study can emphasise overarching trends and factors that influence game design learning within an academic context. This collective treatment allows for the identification of pedagogical patterns and the generation of more robust theoretical insights pertaining to game design education.

The interviews were manually transcribed and coded in NVivo 12 firstly through an in-vivo approach as outlined by Saldaña (2016). The initial codes were then used to generate

categories to capture higher-level concepts related to game design learning. A total of 353 in-vivo codes were identified, which led to the formation of 36 categories (See Appendix E: Game Design Educator Qualitative Coding). A code mapping process was followed to identify emergent themes within the data (See Appendix E: Game Design Educator Qualitative Coding) with five high-level themes emerging: *Experiencing the Process*, *Supporting Game Design Learning*, *Communication and Collaboration*, *Structuring Game Design Learning* and *Developing Design Expertise*. The following section outlines the findings of these interviews by discussing the themes that emerged during the data analysis detailed above.

5.3 Findings

The analysis of educator interviews led to the development of five themes: Experiencing the Process, Supporting Game Design Learning, Communication and Collaboration, Structuring Game Design Learning and Developing Design Expertise. Figure 5.2 below outlines the general relationships between the themes and highlights the interrelated structure of the game design learning process.

The framework shares similarities to the insights that emerged in the previous round but also showed a more complex dynamic at play in the structure of game design projects in educational contexts. The framework places Experiencing the Process as the central component of game design education. While this is generally related to game development projects, it also covers aspects of the process, such as pitching games, researching and playtesting. The game design educators who were interviewed placed a significant emphasis on the role of experiencing an authentic process for game design learning.

Deviating from the process that emerged through interviews with practitioners, the educator's role is in Supporting Game Design Learning and the approaches employed during the process. The educator is in dialogue with the student(s) and the process they are engaged

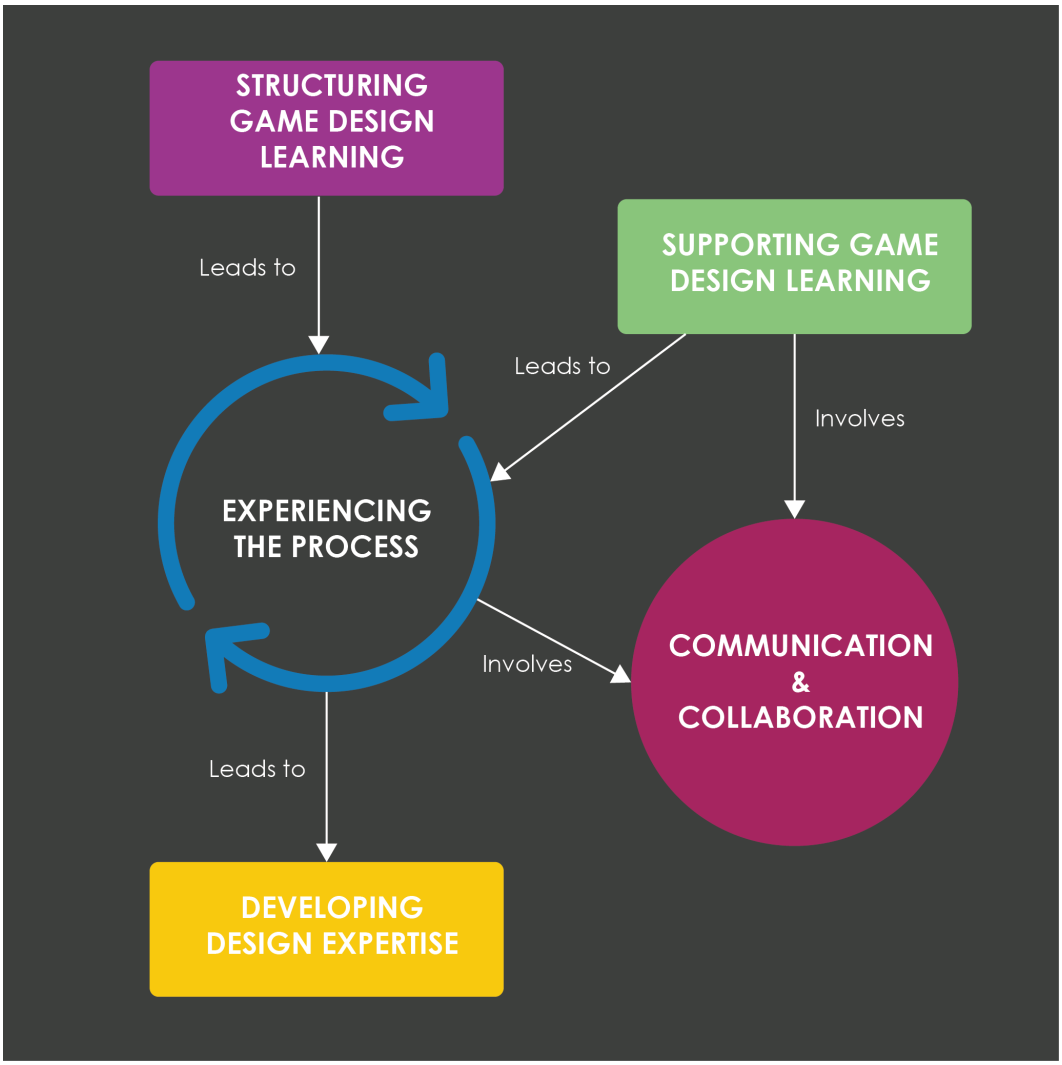


Figure 5.2 Framework of the Game Design Learning Process Based on Interview Analysis. The framework places students experiencing a structured process at the centre, with developing design expertise as the output. While moving through the process, students and educators approach the learning process through communication and collaboration.

in through Communication and Collaboration, which has a more complex character than that of the practising designers. Within the game design classroom, the educator undertakes a process of Structuring Game Design Learning. Finally, it situates Developing Design Expertise as the output of the process within the game design classroom.

The following sections will discuss the themes outlined above and include quotations from the interviewees to provide a richer context to the data.

5.3.1 Experiencing the Process

During this round of interviews, the educators viewed experiencing the process of game development as a core component of game design education. As discussed in Chapter 2 (Understanding Game Design), many game programmes in higher education seek to create an authentic learning experience that mimics professional approaches. The educators discussed the importance of students experiencing the process to develop industry-relevant skills. James, below highlights the relationship between the theoretical aspects of game design and the concept of tacit knowledge:

> *I think design and production are skills that are sets of tacit knowledge that you pick up by doing them over and over again. Obviously, you can teach the theory and stuff, but it has to be in this kind of like tennis game relationship with the practice.*
>
> (James)

This highlights the relationship between theory and practice in the game design classroom, as it is through repeated experience that students develop a deeper understanding of the theoretical aspects of the discipline. The concept of tacit knowledge in design was explored earlier in the work of Cross (1982), who suggests that much of how designers approach their work is through the application of tacit as opposed to explicit knowledge. The approach outlined above focuses on developing a level of tacit knowledge so that learners can put the theory into the context of practice. Similarly, for Ben, the process is something to be repeated to help the students.

> *It's something that we need to kind of grind into them- that this is the process that you go through. You do not, at the start anyways, deviate from it because you are amateurs, you are beginners here, this is something that is going to help you.*
>
> (Ben)

The process ensures the students follow a structured method that will support them in their learning. There is the suggestion that the process should be followed initially, but as

students advance in their studies, it might become more flexible. This is echoed by Adam, below, who highlights how students may adapt aspects of the process.

> *I guess as to what we're encouraging students to go through, the main thing is, again, the process that we're asking them to follow. And, again, students can kind of pick and choose what skills or techniques to do within those, those segments, but the fact that doing iterative practice, the fact that they're critically evaluating their work as well, on an ongoing basis.*
>
> (Adam)

In this example, the lecture is encouraging students to move through a structured process but with opportunities for students to move beyond prescribed approaches. The focus remains on the iterative process and on critical evaluation throughout. While the process is iterative by nature, there are also different stages of game development, as outlined in Chapter 2 (Understanding Game Design). Game development projects often begin with a phase of preproduction (Berg Marklund et al., 2019). Henry, below, discusses the time allowed to students for the preproduction stage.

> *There's the period of preproduction, which is kind of concept phase: concepts, discussion, you know, a little bit of thinking through how it might actually work. Building on those early sort of prototyping ideas, of trying to, you know, keep it simple first and build on it... it doesn't always work because students often want to go off and go for the end product before the start. So, I tend to be quite generous in that phase because you can get an awful lot of coffee cup ideas out of the way. I would, realistically, give a third of the time for that.*
>
> (Henry)

The time allotted to this phase is significant as it allows students to explore and develop a breadth and depth of concepts. The preproduction process focuses on generating ideas, testing, and iterating on small prototypes prior to moving forward. While not directly referencing the same issue as James previously, there is also the suggestion that students will try to skip through parts of the process and move directly into production. James also discussed the reluctance students can experience towards preproduction.

> *They tend not to be really interested in the pre-production type of stuff or they don't believe you can start that way. A couple of years ago, there was a thing at the V&A and we were able to take the students in and they saw designer sketchbooks for AAA games like The Last of Us and it was so good, because it was like, 'Here's what we've been telling you!' and they just can't believe that anything that's that glossy, starts off as scribbles and nonsense.*
>
> (James)

In this example, the students visited the *Videogames:Design/Play/Disrupt* exhibition (Victoria and Albert Museum, 2018), which included game design documentation and preproduction work samples from commercial games. By seeing examples of how practitioners approached the preproduction process, students could better understand its significance in the development process. This suggests that students observe a difference between professional and academic practice whereby the work produced in game studios carries more weight than the significance placed on the concepts by the lecturers. Henry below outlines how they move from preproduction into full production.

> *After that, then it's very much the main body of the work, the build phase and I would use the build, test, evaluate, build, test, evaluate, iterate, and it would be you know, the sprint model, I'd have regular updates, there would be a lot more meetings regularly at that point. And then the last phase, which would be, you know, the last 20% would be the kind of polish... I mean, you know, the idea of polish in real life versus polish for student work is completely different. It's more a case that they have time to finish off things they're supposed to complete and to test it, that they do the following testing and they're writing all the way along, well they're supposed to write all the way along.*
>
> (Henry)

This approach focuses on an agile process where iteration and evaluation are supported by critical evaluation. The development methodology emulates aspects of professional practice but also is adapted to suit the requirements of the academic context, with students writing about the process throughout. Henry also describes leaving time at the end of the project to allow students to polish the project to the standard of a student game, highlighting the different expectations of academic and commercial game makers. Similarly, Adam below outlines how they try to adopt an iterative approach within an academic context.

> *And you know, iteration is really the big thing, I think universities and higher education structures are set up in a way to almost fall into waterfall-based production, you know, you've got a start point and you've got a deadline at the end of 15 weeks, and you just work in a linear fashion. Whereas what we try to encourage is various steps and milestones in an iterative manner. So maybe a student team is developing a game or a prototype within a six- or seven-week period and then using the second half of the module to do further iterations, maybe two or three different cycles within that time once you've got a minimum viable product. And what we see at the end of it is students that really do push themselves and create something that they're proud of at the end of the day. But probably of much higher quality than what we would expect someone to do in a waterfall method and I think it all comes down to the process more than anything else.*
>
> (Adam)

This quote highlights how the educator considers the outcomes of an iterative development approach, broken down into a series of milestones, as producing superior outcomes when compared to a more traditional waterfall approach. Interestingly in an academic context, there is a limited amount of time for iterative cycles, so the objective is for the students to experience the process as opposed to directly modelling professional practice.

One of the challenges students face when asked to follow the game development process is the issue of scope in game projects. The scope is a major topic in game industry discourse, and much of the reporting around game delays scope can be an issue. In *JETT: The Far Shore*, Hammond (2021, p. 146) highlights the challenges faced by experienced developers when dealing with scope. Below, Ben provides insight into the issue of scope in student concepts.

> *I think what typically happens is what they present scope wise is really big. I think students don't understand, you know, even in their second or first year how big and how long it will take to deliver a game that they're presenting. So, it is really like cutting back certain systems within the game, I find a lot of students, they're making a demo and it might be, like, 10-15 minutes long, but they really want to have this complex inventory system in it. And I'm like 'But will the game really cater for that in a way?' Like, you know, 'You've got 15 minutes [of gameplay] how long do you expect me to spend inside an inventory system with a small amount of items?' So typically, something's got to get discarded?*

(Ben)

The above quote highlights the concerns several educators discussed around the scope of student games. In particular, students often seem to want to create games with all the elements that they see in commercial releases. In the example above, the educator questions the value of spending limited development time on an inventory system when the game will have a short play time. The challenge for the students, in this case, is that their lack of experience with the process impacts their ability to plan for the complexities of development. Mia below describes presentations as a method to ensure students maintain an appropriate scope for the project.

> *That's why we encourage them to give presentations to make sure that they're not under-scoped and that they're not over-scoped.*
>
> (Mia)

The presentations are used to monitor the process, and many of the educators discussed regular check-ins, whether informal or formal, during the development process to monitor progress. While Mia mentions over-scoped projects, this was generally less of a concern and below she elaborates on the concerns around the scope.

> *They need to deliver something, so it'll need to be appropriately scoped. But they don't think about scope enough and I think that's to do with the fact that again, and we see this in a lot of our students, there's no realistic understanding of how long things take. So, I think they constantly think everything's gonna go smoothly, everything's gonna go perfect, I'm gonna go in engine and everything's gonna work perfectly fine and I won't need to problem solve anything. And I think by like, allowing them to learn that is an important lesson.*
>
> (Mia)

In this extract, Mia highlights the value of gaining first-hand experience of the process for students to gain an understanding of the appropriate scope for game projects. The experience of over-scoping a project can be seen as a learning opportunity as students encounter issues

that they had not expected when they move from concept to production. This relates to the concept of transformative learning (Mezirow, 2008) whereby students learn through a transformative experience: in this case, over-scoping and experiencing the consequences of their decisions to learn what is appropriate. Similarly, Neroni and Crilly (2021) suggest adopting a similar approach termed *Demonstrated Vulnerability*, whereby students are more receptive to first-hand experience when compared to traditional didactic modes of instruction. The below extract highlights the long-term impact of student engagement in the process.

> *The way we teach where I am is that there's no new didactic technical teaching in the third year. It's very much a case of, you know, the game that you pitch you need to be able to make at this stage. So, if you haven't learned an engine by this point, you're going to be doing something on someone else's game or you're going to be making a tabletop game or doing something on twine or whatever.*
>
> (James)

By the time students in this programme reach their third year the focus moves teaching to a focus on the development of games. The expectation is that at this stage, students must focus on developing design expertise through implementation as opposed to through taught content. James highlights that students who haven't, at this stage of the programme, learned the development tools must either find a role working with others or move to less technologically demanding design outcomes such as tabletop or twine games. Mia highlights how implementation and the process become more important as students move through the programme.

> Taking ownership and having the courage to present work, when it's not finished, I think is really important and I think students need to get used to that. [...] You need the players, you need it in motion to understand whether it works or not and I see a lot of them getting the fourth year and being so scared of failure being so scared, oh, this is the one big project that needs to be perfect and polished. That they're not working on it constantly and I think you need to be working on it constantly.
>
> (Mia)

The uncertainty and fear create a challenge for students who, at this stage of their studies, must produce a major game project. Mia suggests that students should take more ownership of their learning to gain confidence in their work.

This section has discussed the centrality of Experiencing the Process to game design educators' approaches in their classroom. Educators described the experience of the development process as both the site for generating tacit knowledge and as the place where theoretical concepts can be explored in depth. In addition to this, they discussed the issues students face in terms of understanding the project scope and the difficulty of taking ownership of their learning within this process. The following section will discuss the theme of Supporting Game Design Learning and how educators consider their role in supporting students in game development projects and the processes they employ.

5.3.2 Supporting Game Design Learning

This section will discuss the role of educators in supporting the design process. Educators contribute to the approaches undertaken by students by providing guidance and feedback on the design process. The section discusses how educators encourage students to approach the task of game design. As this round of interviews focused on the processes educators employ, the student approaches are told from the educator's perspective and, as such, represent how educators see students approaching the design process instead of first-hand student accounts of the process.

The educators interviewed in this round of the research saw themselves as supporting the design process through feedback and tutoring, where they try to make potential issues in the design visible to students. In addition, the educators interviewed often viewed themselves as producers within the game development process, again highlighting the relationship between industry and academia. Mia below highlights their tutoring role within the game design studio.

> *I walk from team to team, just have a chat about like 'Okay, where are we? Oh, but you said, you're gonna do this. What happened to this? Why did you take it out?' I'm kind of trying to constantly ask them questions, like, 'Have you thought about this?' But that's because I know each of the projects by then, so I think we've moved a bit away from the formal presentation, they still present to their peers and to us but it's not a PowerPoint presentation, it's mostly 'Talk me through what you have, show me your level layout, show me your character concepts, whatever you've been working on'.*
>
> (Mia)

Similar to other design disciplines, the educator sees their role as asking questions and bringing design issues to light. M. Davis (2017) describes design educators as falling into three categories: the art director, applying the Socratic method and coaching. In the role of art director, design educators act as experts by providing guidance and direction. In the Socratic method, the educator uses questioning to encourage students to find their own approach, while the coaching approach falls between these two by providing guidance and allowing students to find their own direction.

The above quote also highlights the multidisciplinary nature of game design education. Tutoring involves feedback on the formal game design elements such as rules and mechanics but can also include aspects of level design, art, production or other disciplines. This complexity is somewhat different to other design disciplines, where the focus tends to be on the design as opposed to implementation and arguably sets game design apart from traditional design disciplines Andreasen (1994). Adam, below, outlines the importance of the tutoring approach to ensure understanding between the educator and the student.

> *So being able to have a conversation with them and find out more about that before making judgments about maybe the quality of the work and what they could be doing next to iterate and improve upon that. It makes them a bit more receptive and appreciative that you're taking the time to find out more about them and how they're developing as designers as well.*
>
> (Adam)

This quote about the process highlights the importance educators place on building a rapport within game design education before providing critique on the work. Adam believes

that this conversational approach can help to build trust and make the students more open to receiving critiques on their work from the lecturer. Ben below outlines how the students present this work.

> *I suppose that would be the first thing we'd ask them to do, like, you know, present your game idea, we've kind of moved away from design documents and done this through Miro boards so there's better collaboration. But kinda like showing us a flowchart of what the game is going to be, talking about their design pillars, their gameplay loops, that would be all in the first week, we want to see the scope of the game as well, what they're intended to do.*
>
> (Ben)

This example highlights the types of work students are showing to get feedback on. In this case, students provide a Miro board as opposed to a traditional game design document to communicate the overall game design. In addition to providing feedback on the qualitative aspects of the game, the lecturer also considers production constraints and the feasibility of the proposed concepts. The following quote from James gives some insight into the issues that can quickly become apparent in a tutoring approach.

> *Or you'll get a project and it'll be a couple of weeks in, and they keep saying 'We're trying to make a thing like Zelda.' And it's like 'When was the last time you played Zelda?' and then no one in the group has played it.*
>
> (James)

In this example, the students are referencing designing a type of game inspired by the popular *Legend of Zelda* franchise (Miyamoto, 1986). However, through questioning, it becomes apparent that the students don't have experience playing games in the franchise. The tutoring process here is used to bring issues to light that the students had not previously considered. James later expands on how students can be more open when providing feedback than receiving it.

> *Because when they can see what's wrong with someone else's design, that's usually easier than seeing what's wrong with their own, even if it feels socially*

> *uncomfortable to say it. Because you know, when it's your own design, and you're not just doing pure design, you're doing some sort of development, then you get the barrier of: 'Well, if I acknowledge that problem, then I've got to fix it.' And that's a big barrier for a lot of people.*
>
> (James)

James highlights that an obstacle for students in acknowledging feedback is that they will need to fix the problems in their own design. The students not only need to resolve the design issue but also implement a solution which adds complexity to the process. When providing feedback to others they can be more willing to identify the design issues. Henry, below, also highlights some of the obstacles related to students receiving feedback on their designs.

> *Mostly, they're open to feedback, they can get a bit protective about stuff the further along the project, it goes. Particularly when things aren't working, and they know they're not working but they won't admit they're not working. I think it comes down to personality type, I think some students don't like getting feedback and any form of criticism is taken negatively, and you have to be careful with that. This is where the written feedback can become important because it can feel like it's less personal or [less of] an attack when it's written down objectively: 'This is what we've discussed. These are the areas you need to address.'*
>
> (Henry)

This highlights the relationship between the lecturer and the student and points to some of the power dynamics at play. In this example, the educator wants to provide feedback but is also aware that some students may respond negatively. They use written feedback to clarify the issues and depersonalise the process. In addition to the role of tutor, game design educators often discuss their role as similar producers within the game industry.

> *And we would see us as maybe the producers in a way, you know, trying to steer them, making sure that they're on track, making sure that their scope is okay. And just trying to make sure that they're kind of goal orientated as well and they're not just working on something, that they're working on like a particular goal that week.*
>
> (Ben)

The above quote by Ben discusses this production-focused view employed by design educators. In this mode, the focus shifts from the qualitative tutoring approach to one more focused on ensuring the scope and progress through the process are appropriate. The educator aims to ensure that the students are goal orientated in their approach to the project. This may be one of the complicating factors of game design learning, as the challenges of developing design expertise in terms of conceptual and creative skill sets push up against the realities of production deliverables and project scope.

In addition to the roles of tutoring and producing, the educators also described various approaches and tools they used in their teaching to develop design expertise. James, below, discusses the use of design pillars in the classroom.

> *We do design pillars- I really struggle with the language around design pillars. I think it's a very good idea but calling them design pillars, it's not obvious what you're talking about. The pillars need to be broad experiential or emotional or thematic things, otherwise, they just put platforming or something or put a mechanic as a pillar.*
>
> (James)

Design pillars are commonly applied in game development (Lemarchand, 2021); they serve as a form of mission statement for the project. In the case of applying them in the classroom, this educator finds that they can be too abstract for students who may be more comfortable focusing on the formal aspects of game design, such as mechanics. Similarly, Adam describes using the approaches of *GameStorming* (Gray et al., 2010) to support student learning.

> *Gamestorming, I think it's called, and it's got like 100 different techniques for various different stages of a project. It's obviously made for people that don't necessarily come from a game design background, it's more business and project oriented. But I think there's some interesting things in there that we could use and see whether they work or not. So, one of the techniques is things like body storming, which I'm really fascinated by because you put yourself into performance and see what works.*
>
> (Adam)

The *GameStorming* approach is related to games but does not come from game studies or production. Instead, it is a business-focused approach, but in this case, Adam finds it useful to apply with game design students. As professional approaches can present challenges in an educational context, game design educators may look beyond the discipline for teaching approaches.

In addition to acting in different roles within the process, game design lecturers also encourage students to apply different approaches to the design challenges they encounter. Educators often discussed the approaches they expect and encouraged students to use in game design projects. James below discusses the challenges of introducing students to the design process when the discipline can be so varied in terms of design approaches.

> *One of the things that I try and teach them in the first year is that there isn't necessarily a set, valid order of operations for designing a game. So I think the case studies we did in the first year: were APE OUT, Mini Metro, Treachery in Beatdown City, that was a weird one, and then two board games, which were Scythe and Wingspan. They were being taught different things in each case study, but one of the overarching things was that you might have a game that starts out as a mechanical prototype, and then the theme and the aesthetic come later. Or you might have a game that starts with art like for example Scythe and all Jakub Różalsk 's IP.*
>
> (James)

James uses a series of case studies to provide insight into the different ways games can be designed. By focusing on individual examples, the design processes can be made more transparent, and students can consider the approaches that suit their practice. Many educators also discussed the importance of research to student design approaches. For example, Adam, below, describes the market research students conduct for a project.

> *We start off by researching markets and audiences so we look at personas and demographics and various different audiences that are growth areas at the moment here and start to identify maybe what type of audiences we could be making games for. We then take that understanding of audience characteristics and work on concepting of different ideas.*
>
> (Adam)

The above quote highlights the importance educators may place on understanding the market for games before starting development. However, Mia, below, highlights the challenges of encouraging game design students to conduct authentic research.

> *I do encourage them to do research, but they never do research. I have a team right now that are on a client brief, and they didn't even bother to play the games of that client. And I'm like, 'How are you going to propose something for a client if you don't know what they tend to make?' It's ridiculous, they don't do enough research and every time we tell them the same thing, you know, like, 'I want to see you dedicate at least five slides to research. What do I mean by research? Well, if you're doing a level design project, look up level design theory, look up architecture theory, watch some GDC talks, here's the links here's the compendium of resources, engage with them'.*
>
> (Mia)

Mia highlights her frustration when students don't conduct research. The module she discusses involves working with a client brief, Mia highlights the importance of researching the client's previous work but is frustrated when students don't engage in that research. She also discusses having a compendium of resources in this module that students can access as part of their research process. In addition to research, many educators discussed the importance of encouraging students to think broadly when generating design concepts.

> *We asked them to think broadly. So, we didn't ask them to come up with characters to start off with, we asked them to come up with like, the broad themes of what their game should be. And then kind of like chip away at that and come up with characters and settings and things that would fit the theme.*
>
> (Ben)

The above quote by Ben highlights how educators encourage students to think broadly prior to focusing on specific aspects of the game. Focusing on high-level ideas before moving to the specifics of the game. In other design disciplines, there is often a focus on these high-level aspects before moving to more detailed design stages (Hay et al., 2017). The similarity to other design disciplines can be seen in how Mia describes an idea generation session below.

> *Post-its on walls, writing down all ideas, doing the kind of game jam situation. Just put all the ideas on the board and talk them through [...] the 'Okay, this is great, and also this...' so you know, the improv techniques. Then if they're stuck, I encourage them to find props that could help so you know, they can each bring one object and then put them together and then write a story about those. Encourage them to do the subject, adjective, verb exercise as well and see what comes up out of that. They can try out collage or they can try out the cuttings of newspapers, techniques, so I introduce them to quite a lot of them and then I told them to kind of experiment and play around with them and see what comes up,*
>
> (Mia)

In this example, the educator is focused on introducing students to techniques to help generate game concepts. The educator wants students to generate a volume of ideas and build on them to try to find interesting directions for their projects. This example shows how in the early stages of a game design programme, educators may attempt to encourage students to explore the concept space thoroughly. When discussing final-year students, Henry, below highlights the expectation that students are fluent in idea generation.

> *I expect them to know how to come up with ideas based on what I'm asking them to do. 'Where'd you get this idea from? Why is it different?' And oftentimes, I want to see what other ideas did you have, that you threw out?*
>
> (Henry)

This quote shows how the educator expects the students to have internalised idea-generation approaches and be comfortable in applying them. Towards the final stages of the programme, the focus shifts from generating a volume of ideas to generating new or interesting ideas. In addition to conducting research and generating ideas, educators also encourage students to consider their players.

> *It's really designed to encourage students to think more broadly about the impact of their design and the people that they're designing for, so it's not just about, you know, developing an idea that they had over the course of the term or in previous years. But actually, who are they making games for and how do they play games?*
>
> (Adam)

This example from Adam discusses a module focused on applying user experience approaches to the game development process. Not only should the designs be unique and well-considered, but they must appeal to potential players, and the student designers must consider the concepts from those perspectives.

This theme has looked at the role that educators take within the process and the design approaches they encourage students to take. Firstly, they act as tutors, providing feedback and making design issues visible. They also act as producers ensuring the scope and production of the game are progressing appropriately. Finally, they act as teachers applying methodologies and design knowledge to support student learning. The variety of roles and approaches employed in game design education highlights the complex nature of the discipline and the need for the application of a variety of teaching approaches.

Educators encourage their students to adopt a variety of design approaches, from conducting research and understanding how to design different games to generating ideas and designing for potential users. Game design students are encouraged to adopt a number of approaches when designing games. A challenge faced by game design educators is the relationship between design and implementation where the goal of encouraging creative exploration can be challenged by the realities of production and implementation. The following theme explores the role of communication and collaboration in the game design classroom.

5.3.3 Communication and Collaboration

The theme of Communication and Collaboration was evident among educators as they discussed communication with students and among students. The development of soft skills and, in particular, communication skills was seen as particularly important by those interviewed. In addition to this, collaboration and learning to work with others were also

seen as important to game design learning. James, below, highlights the importance of soft skills in the context of game design education.

> *So it's kind of all that forced development of soft skills [...] you know, they could be the biggest game design genius in the world, but if they can't do that stuff, then it's not going to be any help.*
>
> (James)

The above quote shows the perceived significance of soft skills in the education of game design students. James suggests that the development of soft skills is in some ways more important than pure design skills.

> *It's mainly because, you know, from a pedagogical perspective, they're first years and, you know, my philosophy is that to be a good designer, you have to be able to communicate with so many different people on different levels as well.*
>
> (Adam)

Adam, above, echoes these sentiments and specifically focuses on the importance of communication in relation to the practice of game design. In this example, the educator focuses on the development of communication skills with first-year students to ensure that they are prepared for the interdisciplinary nature of game development. This also corresponds with the practitioner interviews, whereby most of the designers interviewed highlighted the importance of these skills in their work. Mia also discusses the importance of communication skills when students are articulating design decisions.

> *I also want them to be able to articulate 'the why?' because that's, again, something that I don't see enough of, is them being able to defend the process and the design decisions that they've made because many times, they just say, 'Oh, you know, so and so game does it like this.' And I'm like 'Yeah, but why does it fit well with your game?' You can use research to justify it, you can use player responses to justify it, you can use, you know, your own reading to justify it, but I need to see some sort of backing or, or even your creative intuition, you know, because that's equally valid. But I need to see that you've thought it through.*
>
> (Mia)

In this example, the educator is acting as a tutor, as outlined earlier and is trying to understand the design decisions that the students have made. Mia is looking for students to be able to defend their work and justify their design decisions. She highlights that many students aren't effective at explaining their design decisions and the rationale for making them. James below discusses using a speed dating approach to encourage students to feel comfortable pitching their game ideas.

> *The exercise I usually do to get them over their kind of fear of peer criticism and pitching is rather than doing it to a group, we do it like speed dating. So, they will create their initial pitch that is kind of describing some sort of design idea. And then they will present it to like five groups of three or something. And hopefully, by the third or fourth time, they are feeling more confident. Whereas if you get people to do presentations, just one off it's just- Hey, stand in front of a bunch of people, and then don't remember the experience because you were so tanked up on like cortisol and adrenaline and stuff that you just don't even remember what happened.*
>
> (James)

This exercise is seen as a beneficial approach for first-year students as a way to get them familiar with the process and is a move from pitching to an entire class to a more supportive, small-group activity. The educator uses their ability to structure the classroom environment to scaffold student learning and the acquisition of soft skills. They want to ensure that the presentation is beneficial for the student and not intimidating. James continues to discuss the importance of building up a community among the students.

> *So it's kind of trying to build up a community of support and get them comfortable. Because when they can see what's wrong with someone else's design, that's usually easier than seeing what's wrong with their own, even if it feels socially uncomfortable to say it.*
>
> (James)

The above quote highlights the importance of peer-to-peer learning within the game design classroom, and the educator suggests students build a community of support within

the programme. Another complexity that may be present in game design programmes is a collaboration between disciplines as outlined by Ben below.

> *Students are put into groups and we set the groups, but it's from multiple different courses. So, some are from animation, some are from game design and some are from sound design, as well. And initially, I think, you know, if you're doing a group project like that we take the first week to get students acclimatised with each other.*
>
> (Ben)

In this example, the game design students work with animation and audio design students to produce a game project. The educator acknowledges that it takes time for the students to form a team that will work effectively together. Adam below describes some of the dynamics at play in group situations.

> *Assessment-wise, their work is individual based and the reason for that is, we have group-based assessments in first year already and we kind of get the sense that that can sometimes be a way for some students to hide their skills or to hide behind the strengths of others. And, you know, we have to have a balance between what can students do within a group but also individually as well and just for this module, I feel like individual assessments help students to be able to identify the strengths and the weaknesses, to push forward from there, and to second, third and fourth year.*
>
> (Adam)

Adam, in the above quote, takes into account not only the importance of the team output but also of the individual contribution. Assessment for this group project is focused on individual work to ensure that team members don't rely on the work of others within the project. An added benefit of this approach for Adam is that it provides additional feedback to students in relation to their capabilities and progress on the programme. Henry also highlights the relationship between creativity and group work.

> *But you know, in a group, all you need is maybe one person to come up with the new things and everybody else to be able to implement that. So, in fact, that*

> *actually works quite well, you don't want five people on the team with new stuff, because then they can't agree on anything.*
>
> (Henry)

In this example, Henry wants the team to work well and collaborate effectively but for him, this can present a challenge if each member has their own vision for the project. In some ways, this could be seen at odds with the core of designerly activity where the goal is to develop creative outputs. However, the collaborative nature of game development means that the voice of the designer may, in practice, be distributed across the team. This is similar to how the practising designers in the previous chapter discussed their working relationship with other team members and the collaborative nature of game design.

This section has outlined the significance of communication and collaboration in the game design classroom. Firstly, learning is structured to support the acquisition of soft skills and, in particular, communication skills. Communication skills form the basis of how students interact with the lecturers and their peers. Finally, collaboration was a significant aspect of game design learning for all educators as students work on group projects. The following theme explores how the confines of academia and the way that educators structure game design learning act as constraints and structures for the design processes students engage in.

5.3.4 Structuring Game Design Learning

The theme of Structuring Game Design Learning considers how the game design process is constrained within an academic setting and how educators structure projects within those constraints. This section explores how game design educators discuss aspects of academia that constrain the student design process and looks at how educators then structure projects and learning activities to fit within these confines. The academic context creates a unique form of game design activity that, often attempts to simulate industry practice but is constrained

by numerous factors. The below extract from James highlights some of these confines, specifically the academic year and semester structure.

> *I think that's all a function of how short a period of time it is, you know, if you're working on something for a year, you can make a big change after three months or something and still have loads of time, whereas if you're only with something for three or four months, then that changes things. [. . .] So yeah, you know, I just don't think there's the time for the way that university projects run for them to do that sort of thing. It would be good to encourage them in some way.*
>
> (James)

In this example, James highlights that in a professional context, a designer might be working on something for a year and has time to change aspects and experiment. However, within the confines of academic calendars, that same time to develop projects organically isn't as readily available. The educator is open to solutions and interested in being able to support students in this way but is constrained by the academic context. The below quote by Mia relates to a similar issue, but instead of the academic time, it's confined by the nature of the module.

> *I want to see their creativity, I want to see them coming up with like, new and crazy things. But also I'm working under the constraints of the module, so on [MODULE TITLE], because they work with a client I'd rather they produce something small and polished even if it's not the most original thing. Because if they manage to finish it, because you're teaching them professionalism, part of that is to be able to finish something, to be able to publish something, to be able to kind of follow the pipelines all the way through.*
>
> (Mia)

This quote highlights the challenges that game design educators face in terms of balancing the development of students' skills with the structure of a client-facing module. The challenge in the above example is that the educator is interested in students developing their creative practice but is constrained by the design of a professionally facing module. Additionally, Mia finds students fixating on grades in an academic context, as outlined below.

> *I think the issue is always with great fixation on grades. I would love to say 'Okay, off you go and come back'. If it's not assessed they're not gonna bother and then if it's assessed, then they're gonna get really upset because they're like, 'Oh, you let us make all these mistakes!' you know. So I think it's a tricky one to navigate because, you know, you're running workshops and things and I think students have become more and more fixated on grades.*
>
> (Mia)

This highlights the conflict between students and their grades within an academic context, a factor that is specific to education. Specifically, it highlights the challenges of teaching within the creative disciplines in an academic context, as creativity often requires freedom; however, academia enforces an incentivised structure. Students may have more creative freedom to work on something if it is ungraded, and conversely, if grades are attached, they may be constrained by the grading rubrics and the nature of the assessment. James, in the following quote, outlines another issue with teaching authentic processes within the confines of academia.

> *I am increasingly feeling like you can't teach design on its own without implementation. Or maybe you can, but it's just a function of the size of university intakes and the fact that we don't really get any control over who comes into the classroom and stuff because of the imperative to just recruit as many as possible. I think it's very, very difficult to teach kind of pure design to an undergraduate class because if you actually rooted out all the students who were genuinely interested in design, and not just, you know, some nebulous idea of working in games, then you would have classes of like five students every year.*
>
> (James)

The above quote focuses on two factors that constrain the game design learning experience, firstly, the nature and size of university intakes that make programmes financially viable and the students themselves. Due to the financial imperatives within higher education, there can be a desire to have larger class sizes which in turn impacts the nature of the teaching methods employed. In this example, the educator focuses on the fact that the theory of game design is difficult to teach without implementation, but they also wonder if this is due to the size of student cohorts.

James also highlights that some students are genuinely interested in the discipline of game design, and others are interested in games but lack a specific understanding of the requirements for game design. This echoes Harvey (2021) who suggests that "*those attracted to game-making are largely those who see themselves as 'gamers', entailing life-long consumption practices related to games technologies, software and paratexts, and a commitment to the industry providing these texts*" (p. 502). Ben, below, echoes these sentiments on the nature of student designers.

> *Students are students, and sometimes they try and skip steps, which is, I think, annoying part, you know. Even in level design, within a project, you know, we try and take students through a certain pipeline, which is- starting broadly, you know, 'What are the themes of the mission in this level? For instance, where is it located? Can we get reference images of that location from any type of media? Can we then build a picture up of what that location is going to look like? Can we do a beat chart, flow chart?' And inevitably, students will skip over that where they will go, 'Oh, it's set in a train station. I know what the train station looks like, I don't need to get my reference images.' I think it's just hammering home, that process is important and if you kind of skip steps, like inevitably, you're going to lose time.*
>
> (Ben)

He suggests that by focusing on the process it can aid students in overcoming these challenges. Ben outlines the process that students should follow but highlights how students will skip steps or try to jump to the end without following the proposed process. For this educator repeating the process and reinforcing its importance can help students to move through a more authentic learning process and ultimately save time by doing the planning and design work early.

While working within these confines educators must create a process that facilitates the game design learning experience. Henry emphasises the significance of following a development cycle with feedback throughout.

> *I think by and large you try and follow that format. The main thing being that you're constantly testing, getting feedback is a crucial aspect of it. I think I*

> *would tend to follow the normal development cycle, maybe not in the ratios but, you know, I think this is something that probably happens throughout the program as well, I think a lot of people follow similar kind of methodologies.*
>
> (Henry)

In the above quote, Henry highlights the importance of creating a format that involves constant testing and feedback on student projects. In addition to this, they suggest a "*normal development cycle*" is followed; however, they suggest that the ratios of each activity are adjusted to better structure the learning. Prior to this, Henry had described their normal development cycle as build, test, evaluate and iterate. The suggestion here is that testing and evaluation receive more focus within the structure of academic projects than in a professional context. Ben talks about a similar structuring and organising process within their programme.

> *In terms of structuring the production for them, we created milestones every week and we had weekly presentations. So the group would stand up, talk about the state of the game every week, and talk about their individual contribution to that game every week as well. There was 10 teams, so we kind of rotated that we had like three rooms, presentations going on in each room and staff would kind of rotate around each room.*
>
> (Ben)

The concept of structuring, producing and managing that process is a central element of how Ben discusses their programme above. There are weekly milestones and presentations, again highlighting the importance of producing work and gathering feedback on a regular basis. This regularity of sharing work isn't solely to mimic industry practice but rather to ensure the game is progressing and the team are working effectively. This also relates to the earlier theme of collaboration and communication as students regularly present their work to their peers and get feedback. The resource constraints on the programme involve staff moving between rooms and presentations to provide feedback. Adam also highlights the importance of feedback throughout the process.

> *I think a majority of our students will look at feedback as something that they get at the end of a process, rather than it being a continual activity. And so, you*

> *know, building points for feedback into the module syllabus has been our way of addressing that so every third or fourth week students have an opportunity to ask to get feedback on the work that they've produced up to that point and I'll set an expectation of what I would hope that they would have completed at that point as well. Just to keep them on track as milestones.*
>
> (Adam)

The above quote highlights how Adam has adjusted their module to structure feedback points on the programme. This serves as an opportunity for students to get feedback from their lecturers. The goal of this approach is to ensure students see feedback as being required throughout the project as opposed to only on the work they produce at the end. A benefit of this approach, according to Adam, is that it can keep students on track and ensure they're hitting the appropriate project milestones for production. Mia also describes a highly structured project below.

> This year, I went in, and said, 'Okay, let's try the other way. Let's give them like a solid amount of constraints. And see how they work with that' and they're flying, like flying colors. They took it and they understood what to take from that and they also built their own way of interpreting the brief. So even if I gave them guidance about what the minigames can be, they chose one that they thought might be fun and they made it work. They said that they absolutely loved the brief, it was so detailed and this was a historical brief, because I'm working with a museum. It gave them all the important historical information they need. But it had information about, you know, who is your target audience, where it's gonna be exhibited. This is basically the design, larger and quite open, but still the design blueprint: It's going to be set in [PLACE NAME], here's the map of [PLACE NAME], it needs to have nested spaces and outdoor spaces and still have dialogue options, because it'd be very dialogue driven. It needs to have fun, easy, mostly quicktime event-type minigames so that they're easy to play in the gallery space. So you know, they had all these constraints and with those, they found it easier to navigate because they felt like their hand was being held enough.
>
> (Mia)

The above quote highlights how a very constrained structure and design space can lead to potential positive outcomes. In this example, Mia has developed a very detailed brief focused on a client's requirements for museum games. The brief essentially acted as a blueprint for

the students but allowed them to be creative within that structure. Interestingly, the students described the project fondly as it differs from the typical conception of game design as a blue sky, creative activity. It perhaps suggests that more structured briefs might support better engagement and outcomes for students. Similarly, James outlines a similar structuring exercise.

> *And then with the shoot 'em up, we did the same thing with like, thematically. 'Oh, it's not allowed to be a spaceship.' I stole that one off someone on Twitter actually, the shoot 'em ups not allowed to be a spaceship and then see where they go from there. Because you already know what the implementation is. And then they kind of get a stretch goal of okay, well, you've made it a submarine. How can you change the game feel to make it feel more submarini? So it's sort of like back and forth between the implementation and the theme.*
>
> (James)

This exercise shows similarities with the previous project Mia discussed, focusing on constraining the students' design space. The primary goal of this project is to encourage the students to think of the theme and design for it so that the implementation and mechanics are less of a concern. These examples suggest a benefit to isolating aspects of design activity to develop student competence within more constrained design spaces. They also point to the potential to allow room for students to produce creative work but remove some of the design complexity from the tasks. Mia also suggests it can be difficult to structure the process as secrecy within the game industry can limit student perceptions of the discipline.

> *It's really fascinating, because I was talking about that with some designers a while back, at [GAMES EVENT] and I was saying like, 'There's all this secrecy in the games industry and because people don't share the process they're potentially creating like, this fake idea in the students, you know'. They just jump into the engine when they want to make something and I'm like, 'No, because that costs money and that costs time, try to work out your ideas and your design ahead so that then you know it will work'.*
>
> (Mia)

This quote highlights how students can be fixated on the development process and jump into implementation without considering the design. While the educator, in this case, has

developed modules and structures to support the learning, they suggest it would be beneficial if the industry were more open about their own practices.

This theme has discussed the aspects of academia that confine the game design learning experience and the structures educators put in place. The semester system in higher education, assessment requirements, university intakes and the nature of student designers all confine the approaches educators can take. Educators must balance these specific constraints with the desire to ensure students are developing their practice as game designers. In addition to these constraints, educators must structure the learning process for game design students in higher education. Firstly, the educators interviewed often implement an iterative approach, similar to the process advocated in design textbooks (Adams & Dormans, 2012; Fullerton, 2019; Lemarchand, 2021). However, educators suggest the process does not directly match practice but is modified to suit the academic context. Educators discussed the value of structured feedback and opportunities to provide critique to students as a key aspect of the process with a significant emphasis. Finally, a number of educators described structured projects that helped constrain the design process and support learners by simplifying the design space. The following section describes the theme of Developing Design Expertise, which describes how educators see the process of developing students into design practitioners.

5.3.5 Developing Design Expertise

This section discusses how the process of game design education serves to develop game design expertise. Ultimately, this is often the goal of game design programmes within the context of higher education, as many are focused on preparing students for careers in industry or individual practice. James, below outlines some of the complexities of teaching game design and the forms of design expertise that he hopes students will be able to develop within the programme.

> *I think it's almost like teaching someone how to cook. You go like, here's one way of doing the thing. 'Oh, you got a curry', here's another way of doing things 'Oh, you got a pie'. And then eventually, you get to a point where you can just get an onion and stuff and look at it and you know, all the sub-processes to make a thing that you want to make. But to get to that point, you need someone to just rigidly go, 'Right we're making a visual novel. That means I need you to define some characters. You know, tell me what the logic is behind the choices in the game. Is it like nice, horrible, silly or whatever?' And then 'Okay, now we're making an arcade action game. How does difficulty ramp up over time?' So it's almost like taking genres of play... the thing that's difficult about games is there is so much variation between all of the things that we call a game, like way more than any other medium like a film, or a song. They have so much more in common across genres. Whereas when you start to look at genres in games, they are totally different things. I think that's all you can do, is you take some of the extremes and go 'Oh, we're gonna make a worker placement business management board game and then you're gonna make a twitch reaction arcade game or something' and then hopefully, eventually, they'll just see what they gravitate towards and they can just exclude the stuff they don't need to focus on anymore.*
>
> (James)

The above extract highlights the importance that James places on students developing design expertise through engagement with a variety of game genres and projects. While he doesn't directly reference tacit knowledge, he discusses how this relates to the importance of students building expertise through experience and designing different types of games. One of the challenges James highlights is the variation within game genres that often require different approaches to design, which practitioners echoed in the previous chapter when they discussed different approaches depending on genre. Henry similarly discussed the importance of developing for different game genres.

> *Depending on the game they'd need to understand the genre, the best thing in class and demonstrate that they actually understand the type of game they're making and to know what the best features of that class genre are. So that when they go to introduce something, and I'm going:*
>
> *[LECTURER] 'Well why have you chosen that?'*
>
> *[STUDENT] 'Well, it worked for these games.'*
>
> *[LECTURER] 'Fine.'*

> *Or, you know, this is not something that's been introduced these games, or this is something that was introduced in a really good game that wasn't done very well. So yeah, absolutely, that's what I would call research for the actual game design thing is playing games and you know.*
>
> (Henry)

For Henry, the students must develop an understanding of genre and how different designers within that genre have approached the design space. He encourages students to conduct research to ensure they are developing their expertise and understanding of the design space. The research students conduct also helps them to justify their decisions and to enhance their expertise by giving a greater understanding of the field. James, in the below quote, describes some of the challenges students face trying to create games without existing expertise.

> *I think often it is more difficult to think about it from a pure design point of view, because I'm not teaching a pure design degree. Often, they get fixated on just piling more and more things into their games. Rather than a specific like conceit or concept or core concern of the game.*
>
> (James)

Students can become fixated on adding additional features to the game without focusing on the core of the design. This form of scope creep may be a result of their lack of experience with the design process and their understanding of the realities of game development. Ben, below, highlights how the production process can be used to support students in the development of design expertise.

> *It's like, the basic things that sometimes they leave out, they have these grand visions of the game, but never really talk about what are the challenges in the game? You know, how does a player win the game, how do you lose the game? I think with students, it's sometimes like trying to keep them to the basics as much as possible, and then letting them kind of flourish during production.*
>
> (Ben)

The above quote highlights how students can focus on big-picture design over details, often to the level of not considering how challenges or goals will be implemented within the

game. However, Ben sees the production process as a place where students can flourish by focusing on the fundamental aspects of the game. Focusing on the production of the game can bring the importance of detailed design into focus for students and they can develop more expertise through this process.

This section has discussed the importance of students Developing Design Expertise within an academic context. Many educators described the game development process as the way in which students develop game design expertise as they build a tacit understanding of game design. However, a challenge for educators in developing expertise is the variety of genres and the differences between those genres within the discipline of game design. While some educators identified issues in the student process due to lack of expertise, the main approach to supporting student development was making games, ideally, supported by research. The following section will provide an overview of the findings from this chapter and their significance that led to the following round of fieldwork.

5.4 Conclusion

The objective of this study was to answer the research question:

RQ 2: How do educators structure game design learning in higher education?

This chapter discussed a series of interviews conducted with higher education game design lecturers to answer this question. Within this study, a theoretical framework was developed based on the qualitative interview data that was gathered and analysed. The framework has similarities to the practitioners in the previous chapter but also differs in a number of areas. The findings of this chapter add to the following research contribution.

RC 2: An account and interpretation of game design learning in higher education.

At the centre of the educator framework is the importance of experiencing the process. All educators interviewed viewed this as a critical element of game design education and discussed this in detail. Similar to practitioners, they see the process as central to the development of design expertise. However, there was less of a focus on the cyclical nature, perhaps due to the artificial nature of the time constraints within an academic context.

The process students experience is supported by the educators who act as tutors and producers to ensure students remain engaged in learning. The educators also encourage students to apply and adapt game design methodologies to solve the challenges they face within different projects. This differs from the discussion with practitioners that focused on specific approaches to solving design and the different ways they approached game design problems.

This approach to game design learning is then mediated through communication and collaboration, where students are expected to become proficient in communicating and articulating their designs and critiques to peers and educators. One point that is worth considering is the significance and regularity of pitching work that is encouraged in game design programmes. While practitioners discussed the concept of having to sell design vision and generate consensus, they didn't focus on formal pitches but rather on discussion and collaboration with their team.

An area unique to the academic context is the constraining and structuring that the academic context places on the practice of game design. Educators must design and support learning experiences through a variety of constraints that differ from professional practice, such as grades, semester and student designers.

Finally, while within a professional context, the overall outcome of the process is a game (hopefully successful!), within the academic context, the success criteria focus on students developing design expertise and being able to design for a variety of game genres

and contexts. Ultimately the educators viewed the process as a way to ensure students developed design expertise through an authentic learning experience.

The study also leads to a further understanding of the game development project as the signature pedagogy (Shulman, 2005) within game design education. This finding leads to the following research contribution:

> *RC 4: Proposing the game development project as the signature pedagogy of game design learning.*

The educators interviewed in this study emphasised the central role of the game project in facilitating effective learning and skill development within game design education. When discussing the role of the project in game design learning educators saw it as the main pedagogical approach through which students gain expertise by simulating elements of industry approaches. This study suggests that the game design project has certain characteristics:

- It follows a structured process, ideally involving research, ideation, implementation, evaluation and iteration.
- It is constrained by academic timetables and assessment requirements.
- It involves authentic design challenges, students are creating playable games with the goal to appeal to players.
- It requires not just design but production and implementation skills.
- It often involves group work and high levels of collaboration.
- Students take an amount of ownership in their learning.
- Students are expected to provide and accept feedback.

- Lecturers act as tutors supporting students and producers focused on scope and deliverables.

These characteristics suggest the game design project is a complex pedagogical space. While educators discussed other modules and approaches to game design learning the design project was often seen as particularly significant.

The study did not provide insight into the actual processes employed by game design students and the approaches they take in solving design challenges. It instead gave insights into how educators within the context of higher education structure game design learning. Following this study, a final phase of empirical fieldwork was conducted that involved observing the game design process of students during a 6-week development project which will be discussed in detail in the following chapter.

Chapter 6

Experiencing Game Design Learning

This chapter presents the results of observations carried out within the game design classroom. The previous two studies involved interviews as the research method, while this study incorporates methods aligned to ethnography, such as fieldnotes, reflective accounts, student designer development logs, and completed game projects. The goal was to observe the design approaches students employ in the production of playable artefacts.

The goal of the study was to gain an understanding of the student perspective within the game design classroom and the design approaches they employ over the course of a project. The study involved observation within a game design classroom over a six-week period at TU Dublin. The student design process was analysed using a grounded approach with the goal of uncovering new insights. From this analysis, elements of the design process common with practitioners and unique to the student perspective were identified and contributed to the understanding of the student process and the potential for educational interventions.

The chapter begins by providing an overview of the research objectives, followed by an outline of the specific research design employed for this study. It then presents and discusses the findings and finally concludes by relating the findings to the previous phases of the research.

6.1 Objectives

The objective of this study was to answer the research question:

> *RQ 3: In what ways do students apply game design approaches within game development projects?*

The goal of this phase was to conduct empirical research to understand how students move from project initiation to completion and the processes they employ along the way. Finally, it sought to consider these findings in relation to the previous chapters to understand how student approaches relate to professional practices and educator objectives.

The research presented in this chapter forms part of the descriptive study as outlined in Figure 6.1. It builds on the findings and understanding developed in the previous chapters to consider how students experience game design learning. The themes that emerge through the thematic analysis expand on the game design process from the student's perspective. It expands on the themes encountered previously in Chapters 4 and 5 to provide a basis for the development of a game design learning model and classroom supports.

6.2 Research Design

The study presented in this chapter sought to investigate how students move through design projects and in doing so, gain a deeper understanding of the processes they employ. Data was gathered from first-year game design students on a four-year BA in Game Design at TU Dublin, Ireland. The observations took place during the final six-week project in a Game Tools module that introduced students to the Unity game engine. The students at this stage of the programme had a basic understanding of Unity development and had a grasp of the foundational concepts in game design and production. Data was gathered in the form of field notes and reflective accounts, development logs (DevLogs) and games produced by

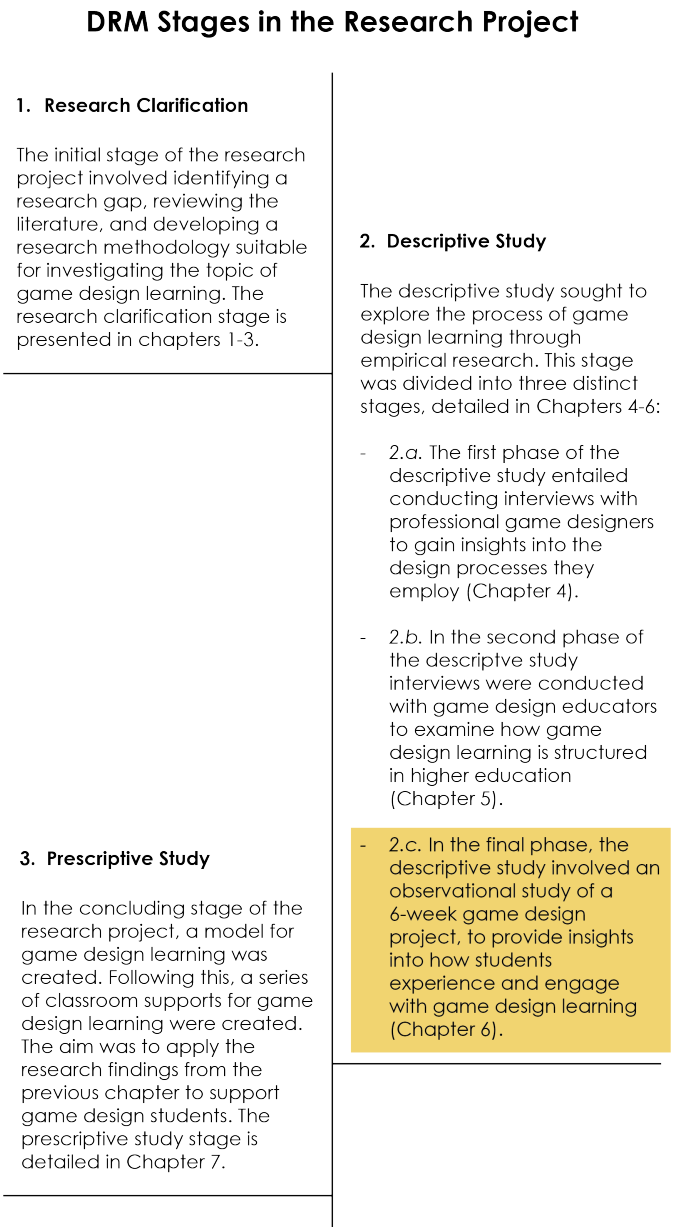


Figure 6.1 The research presented in this chapter is the third and final phase of the descriptive study conducted.

the students during their projects. The research design was intended to be naturalistic to minimise the impact of the study on the students' learning. Based on the work of Charmaz (2014), a grounded approach was employed in the research design that included reflexivity through fieldnotes to account for my own worldview as an educator, my status within the classroom, and my background knowledge concerning game design education.

The Game Tools 1 module is a semester two, a first-year module on the BA (Hons) in Game Design at TU Dublin. The module aims to introduce game design students to Unity as a tool for game development throughout the remainder of the programme. The first six weeks of the module focus on the use of the Unity game engine as a development tool, with a weekly focus on different features offered by the engine, such as 3D geometry, lighting, animation, audio, physics, etc. The second six weeks of the module involve a game project where students work in groups to produce a playable game from concept to release on itch.io. The project theme for students in 2022 was "*The World Will End in Five Minutes*", the full brief can be seen in Appendix G: Game Tools Project Brief. The project timeline was as follows:

- 21st March: Briefing
- 28th March: Concept Presentation
- 18th April: Playtest
- 11th May: Project submission

The study was designed to explore the studio project as the signature pedagogy of game design. Table 6.1 below provides an overview of the criteria for game design projects from the previous chapter and a description of their implementation within this project. The goal was to ensure that the observations conducted within this study reflect the nature of the game design learning experience.

All students within the class were given the opportunity to opt-in to the study by completing a consent form prior to starting the final module project. In total, 32 students in eight teams participated in the study, and the data were coded using a grounded approach (Charmaz, 2014), with initial line-by-line coding generating 236 individual codes. Line-by-line coding was applied to this study as it can "*help you to see the familiar in new light*" (Charmaz, 2014, p. 55). The line-by-line coding process was particularly important,

Table 6.1 Mapping the criteria for game development projects to the Game Tools 2 project.

Criteria	Project Implementation
It follows a structured process, ideally involving research, ideation, implementation, evaluation and iteration.	The project was structured to encourage 1 week of concept development, 3 weeks of prototyping, 1 week of playtesting and 2 weeks of iteration.
It is constrained by academic timetables and assessment requirements.	The project took place over 6 academic weeks with a two-week break due to the university spring break.
It involves authentic design challenges, students are creating playable games with the goal of appealing to players.	The final deliverable for the project was to release a playable game on itch.io.
It requires not just design but production and implementation skills.	Students were responsible for the design, production and implementation of the projects.
It often involves group work and high levels of collaboration.	Students worked in teams of 4 and self-assigned roles.
Students take an amount of ownership in their learning.	Students had a basic understanding of Unity prior to the project but would need to develop an original game design.
Students are expected to provide and accept feedback.	Concept presentations and playtest sessions provided formal opportunities for feedback while additional informal feedback was encouraged.
Lecturers act as tutors supporting students and producers focused on scope and deliverables.	Throughout the project my role focused on supporting students and assisting them with production.

given my relationship to the research. It allowed me to analyse the data from a more distant perspective and uncover unexpected insights into the game design classroom, a space which previously felt very familiar to me.

Following this, axial coding was conducted (See Appendix F: Student Qualitative Coding) by grouping design activities as per Strauss and Corbin (1990), leading to five

high-level themes and 4 sub-themes. A theoretical framework for the data was developed (See Appendix F: Student Qualitative Coding) with five high-level themes emerging from that data: *The Context and Complexity of Game Design*, *Applying Design Approaches*, *Communication and Collaboration*, *Initiating the Game Design Process* and *Game Design Outcomes*. The theme of Applying Design Approaches included four sub-themes. The sub-themes provided additional insights into the data and aided in understanding the complexity of the student design approach. The findings were analysed with reference to relevant field notes, reflective accounts and in the context of the final design outcomes. The following section outlines the findings of this study by discussing the themes and sub-themes that emerged during the data analysis detailed above.

6.3 Findings

The analysis of educator interviews led to the development of five themes: The Context and Complexity of Game Design, Applying Design Approaches, Communication and Collaboration, Initiating the Game Design Process, and Game Design Outcomes. Given the complex nature of the game design process, Figure 6.2 below depicts the relationship between these themes.

In this study, the data showed students moving from design problems (or initiations) to solutions (or outcomes) via a variety of design approaches. The chosen design approaches were often influenced by contextual factors as well as the role of communication and collaboration. This research highlights the complexity of design approaches identified across domains such as open-ended design, world design, technical design and player experience design. These are not intended to be prescriptive or exhaustive but rather illustrative of the process and the inherent complexity of implementing game design projects.

Observing the student process helped to develop a deeper understanding of the learning taking place and specifically the challenges students face. I identified students Applying

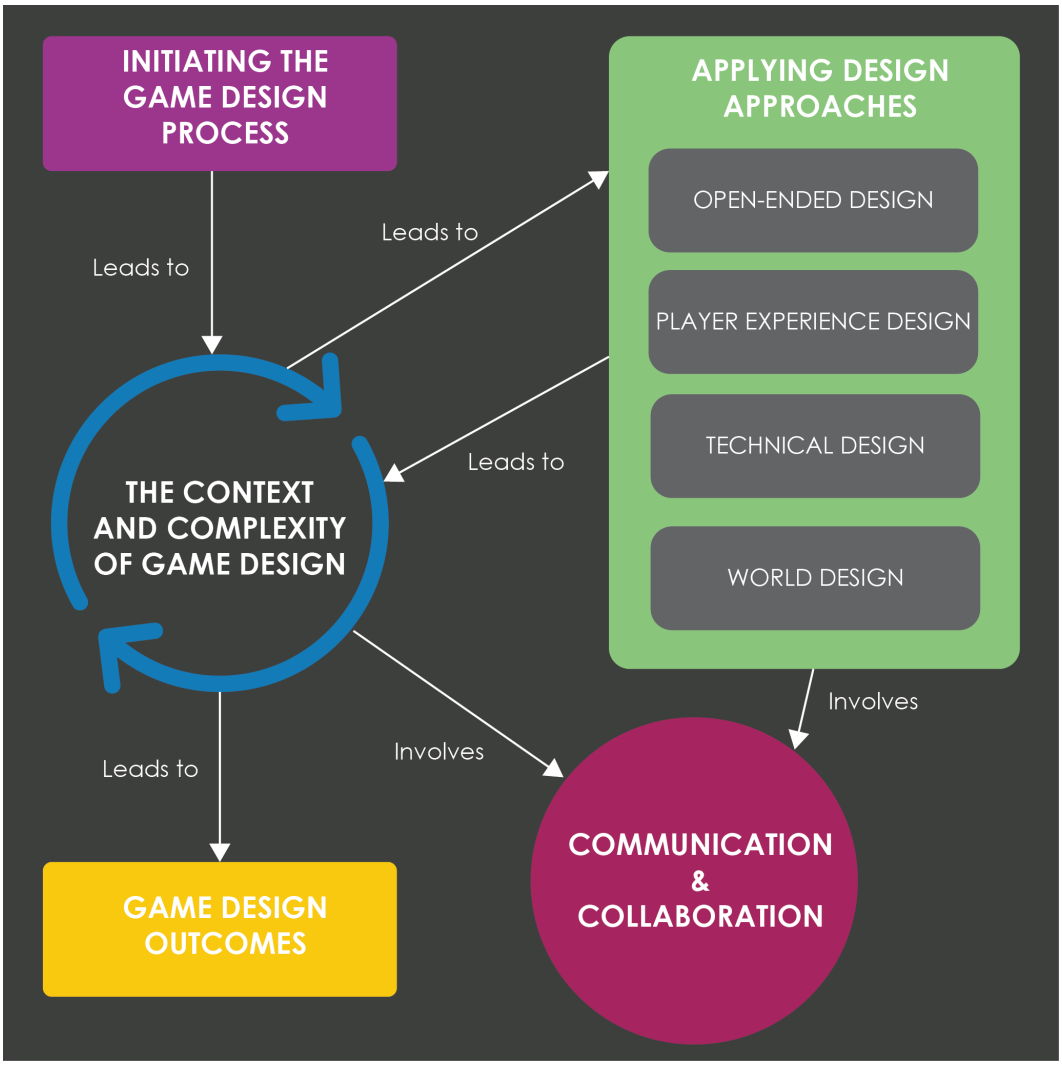


Figure 6.2 The theoretical framework for Student Design Process based on data analysis. The model proposes design is initiated, takes place within a context, and leads to outcomes. During the design process, students apply a variety of design approaches mediated through communication and collaboration.

Design Approaches such as Open-Ended Design, Player Experience Design, World Design and Technical Design. As the projects were team-based activities, the role of Collaboration and Communication was an important factor as the students navigated the development process with both individual factors and teamwork affecting the game's design. Within the classroom, The Context and Complexity of Game Design took an important role as students were balancing complexity, managing production, and navigating technical challenges. For

the student designers in this phase, there were two different modes of Initiating the Game Design Process: externally initiated game design and self-initiated game design. Finally, Game Design Outcomes were viewed differently depending on how students perceived their success, either accepting design outcomes or viewing it as an opportunity to develop design expertise.

The following sections will discuss the themes outlined above and include quotations to provide a richer context to the data. The first theme, The Context and Complexity of Game Design, will discuss a number of contextual factors that played significant roles in the development process.

6.3.1 The Context and Complexity of Game Design

The theme of The Context and Complexity of Game Design encapsulates a number of contextual factors that impact game design learning. Firstly it considers the complexity of the development process and how students aim to balance this complexity with their capability. Then it considers the context of game design projects as complex production challenges that students must manage through development. Finally, it describes the challenges students encounter due to the technical challenges inherent in realising game design projects.

As discussed in the previous sections, game development can be complex, creating challenges for students to develop their own games. Team 3, below, discusses this complexity in relation to an inventory system they are designing.

> *We designed some rough concepts for inventory. In the image below [Figure 6.3], items such as backpacks can be picked up for extra space (allowing two tile objects), and there is an on-hand option (what the player is always holding). While items required gates are important, we also felt that having knowledge (e.g. a four-digit code for a door) is essential in making the player feel smart and saving time.*
>
> (Team 3, Week 2)

The student above discusses their design for an inventory system (See Figure 6.3) that will allow the player to store and interact with items they encounter in the game. In addition, they consider how players might expand their inventory by collecting new items and even considering the knowledge the player gathers that might not be on the inventory.

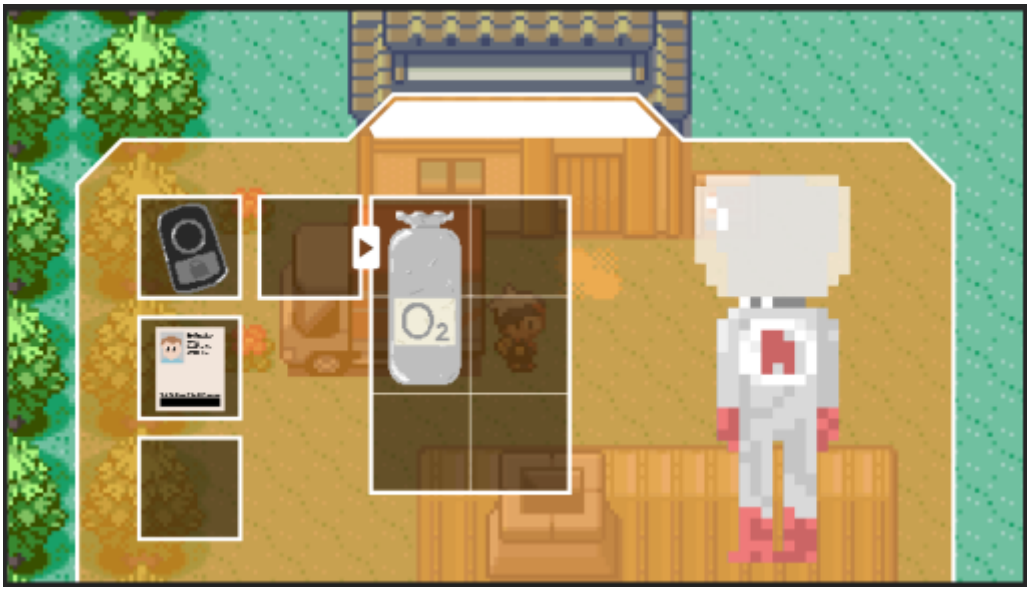


Figure 6.3 Example of game inventory design created by Team 3.

In the previous chapter, Ben discussed the design of inventories as a potentially poor use of time on short student projects. The students feel collecting items and filling an inventory, will make players feel a sense of accomplishment in the game. In addition to this, the students must design around complex interactions between systems.

> *Much of the scripts in the game are quite linked together to prevent overlapping in gameplay. For example, we don't want players to be able to move, shoot or take damage if they are within a dialogue sequence with an NPC.*
>
> (Team 4, Week 3)

The above quote from Team 4 highlights these interactions between different systems within the game. In order to accommodate dialogue sequences, they need to prevent the player from being able to shoot or interact. This complexity, however, can be self-initiated by the designers themselves as illustrated below.

> *I implemented the idea of timed puzzles. I think these are a must in platformer games. My idea is very simple and I came up with it when thinking about a minigame in another game. I took inspiration from the minigame Princess Quest in Five Nights at Freddy's: Security Breach. The minigame uses mirroring to activate 6 lamps to proceed. I thought having a timed level where you have to collect a certain amount of something to open the door would be a good addition.*
>
> (Team 2, Week 4)

In the above quote, Team 2 discuss taking inspiration for one of their minigames from the game *Five Nights at Freddy's: Security Breach* (Steel Wool Studios, 2021). This inspiration leads to a complex design that includes a number of elements that could prove challenging during development. In addition to this students often try to gather feedback on their designs early in development.

> *Before changing the design, we wanted to get a sense of the game's feel in Unity, so we created a draft. The problems that arose were that the map was too small, the character moved too quickly, and the camera was too far away. While this map was never going to be used as a final part of the game, it gave valuable insight that we can use in our final version.*
>
> (Team 3, Week 2)

Team 3 discusses creating a draft (or sandbox) level in order to get a better understanding of how the game will feel to players. By implementing the design to a draft level, they were able to identify issues with their design that allowed them to modify their game based on their own experience within this level. Another factor that impacts student development projects is the ability of student teams to manage the production process. Team 7, below, outlines the roadmap for the development of their game.

> *This is our roadmap*
>
> - *Week 2: ship movement and timer will be made. Hopefully, the ship sprite is done by then*
> - *Week 3: ship shooting, health, and enemy movement would be done while the art team do the assets and background*

- *Week 4: The level, score system, and main menu should be done.*
- *This roadmap can change.*

Things like ship upgrades, local multiplayer, and more stages won't be in the game at launch.

(Team 7, Week 2)

While the roadmap focuses on high-level concepts such as movement, timers, shooting, health, etc. The roadmap is different from a detailed production plan as it lacks specifics on who will do tasks and how they will be integrated, tested and iterated. The roadmap does, however, leave open flexibility in terms of development and includes features that the team would like to include in future.

The team members building the house had a list of what items needed to be interactable for the endings so that those coding could make sure that they knew what they had to work with. Prepped with this list, the coders got to work on the controls for interacting with items but we didn't foresee it being as difficult as it was.

(Team 8, Week 4)

Team 8 above describe a similar high-level plan for development but also highlight the challenges that came about by trying to implement the design. In this example, the team felt that the programmers would be able to implement features based on a planned number of items. However, this created challenges for the programming team as development progresses. This highlights how the experience of learning to scope game development work appropriately can often come from first-hand experience, as discussed by the educators in the previous chapter. As production moves forward, Team 2, below, discusses the impact of university holidays on the production schedule for their game.

In this devlog, most things touched on happened over the course of 2 weeks, as we had easter during this time, so production slightly slowed down, that said we managed to stay relatively on track. during this time, as a team, we realized how much we needed to get done for the upcoming playtest session, and we will be working over the next week to finish implementing these features and mechanics.

(Team 2, Week 3)

TU Dublin takes a two-week spring break (Easter) that led to a slowdown in production work. Despite this slowdown, the team believe that they managed to stay on track. This example highlights the importance of milestones and deliverables in terms of student projects which echoes the comments of practising game designers who often discussed finding deadlines to be a motivating factor in moving forward with the project. The educators in the previous chapter also highlighted the importance of deadlines in student design projects. The deadlines can also serve a function to allow students to effectively understand where they are in the development process relative to the time remaining.

> *We had become focused on the game world and narrative that the actual gameplay aspect was forgotten. Luckily, this playtest took place three weeks before the submission deadline, so we will have time to alter and make changes. In terms of making the gameplay engaging, we began thinking of smaller tasks rather than just having one long term goal.*
>
> (Team 3, Week 4)

Team 3, above, highlights how they had become focused on high-level world-building aspects of the game to the detriment of the core gameplay. The playtest milestone allowed the team to identify this issue and focus on the core of their game. As many of the educators discussed in the previous chapter, the context of the game development process served as the site in which design expertise was gained through first-hand experience. In addition to the production challenges which influenced the context of development, a number of technical challenges also affected the development process. Within the context of game development projects, the technical challenges presented can have a significant impact on the time available to achieve the team's design vision.

> *There are two worlds in the game, the exterior and the interior. When the player approaches a door and enters, the exterior world is turned off, and the interior one is turned on. The same is done for its colliders, the invisible walls. However, the problem arose at the corners of buildings and near the entrances, where the player would trigger the interior world without actually being in a building. So*

> *if this happened, the game would become unplayable, and the player would need to start over or just stop playing.*
>
> (Team 3, Week 5)

The above quote by Team 3 highlights how designing consistent game worlds can create challenges that the students had not anticipated. The group had designed a system where moving from an exterior location to an interior one involved turning off all elements of the exterior world. Due to collision issues, the player could trigger this from an exterior location and end up with a bug that prevented them from progressing. While this may seem logical, it also highlights the amount of testing students must do to ensure that their world will behave consistently and in line with their own intent. Team 8 highlight how the technical challenges of game development limited the amount of information they could gather from a playtest session.

> *We had our first playtest for the game during our class time on Monday 25th April. By this time we didn't have too much done in the way of actual gameplay due to the struggle we had with interaction code but fortunately we had working movement and interaction code for the playtest.*
>
> (Team 8, Week 5)

In this example, the students discuss how much of their gameplay wasn't implemented due to technical challenges that they had not anticipated. Their lack of experience with the process and the tools had led them to be overly ambitious. Consequently, they were unable to get as much value from the playtest as they would have liked. To overcome the technical challenges encountered students can look to a number of sources for solutions.

> *I decided to make the player controller first when we started the project to allow for easier initial testing of the game's whiteboxes. Brackey's and many forums online helped with forming the basis for some of the code structure of the game. Much of the code was adapted further by myself. Initially, we had planned to use an isometric camera as mentioned in the first dev log, however, due to how the levels were created, we decided to change to a free look camera around the time of the playtest.*
>
> (Team 4, Week 3)

The above extract from Team 4 discusses some of the technical considerations faced by student game designers. Within the taught component of the module, the students created a rudimentary player controller[1]; however, for this game, the team wanted a more advanced controller. The use of online resources and tutorials formed the basis of this controller, with the student refining the code on their own to better suit their needs.

The quote highlights the value of online resources and the availability of supplemental learning materials in the context of game design learning. Because game genres can be so varied and require very different technical approaches, the students must look beyond the classroom material to achieve their goals. It is also worth noting that the students weren't required to create sophisticated controllers but chose this as a technical and mechanical challenge for their team to implement. Similarly, the factors affecting the process also involve working across different software tools.

> *Having a whitebox to refer back to when designing environments in blender was extremely useful, as it gave me an idea of the layout & flow of the level. Unity's lighting system is unfortunately, not quite as powerful as Blender's Eevee lighting & rendering system, However, the scenes still make use of many point & area lights, to try to emulate the lighting featured in blender.*
>
> (Team 4, Week 3)

The above extract from the Team 4 DevLog highlights the challenges of working across software tools. The student had a level whitebox from Unity that they could use when developing the custom game assets in the 3D modelling programme Blender (Blender Online Community, 2022). When the student created assets in Blender they used the inbuilt lighting system. However, the results of this did not transfer directly to the game in Unity, and the student had to attempt to recreate this effect in the game engine.

Throughout this section, the Context and Complexity of Game Design have been explored as they affect the student design process. In particular, this section looked at how student

[1] A player controller refers the interface between the game engine and the player input. It is the computer code that enables an onscreen avatar to respond to the player input.

designers balance the complexity vs achievability of their projects, how they manage the production process and finally, how technical challenges influence the design process. The following section will discuss the approaches student designers applied in the design of their games.

6.3.2 Applying Design Approaches

Within this study, students applied design approaches from four different perspectives: Open-Ended Design, Player Experience Design, World Design and Technical Design. These approaches were often combined to create solutions to design problems.

Open Ended Design

Open-ended design is a generative or "*blue sky*" design process and is often focused on high-level concepts. This type of design is characterised by brainstorming, developing a design vision and thinking through design decisions. This process includes generating ideas and evaluating their suitability through discussion as a team:

> *So throughout the week we were discussing what ideas would work for us to make a game that fitted the genre we were given. When we were given the brief, we started to think and discuss different ideas that would make our game. We came up with different key ideas and throughout the week we continued to work on the ideas. We created our first brief concept into a PowerPoint and there onwards we continued. Towards the end of the week we had worked on our first concept of our game.*
>
> (Team 8, week 1)

This process is often focused on what is ideal instead of achievable, with another group outlining how they took inspiration from similar games/media, including complex mechanics which hadn't been covered in the taught component of the module.

> *We went through many early concepts on how we can make a game like this interesting and unique to the player. Our initial inspiration came from*

> *DeathLoop (2021), OuterWilds (2019), Minit (2018), Prey Moon Crash (2017) and The film Groundhog Day (1993). The central concept we wanted to explore was the risk/reward of resetting the loop early, keeping items or playing out the whole loop in order to discover and explore new areas. We also wanted to implement a way to save items between loops, which would speed up the gameplay.*
>
> (Team 3, week 1)

The brief for this project specifically focused on a concept within released games at the time of the project, the time loop. The above quote highlights some of the recent game releases that used time loops as unique mechanics. However, the student also mentions the movie Groundhog Day (Ramis, 1993) as an example from wider media as a reference for the design process. This shows the impact of different media as an inspiration for the student design process. While the above student discussed their sources of inspiration, students can also identify points of departure based on their requirements.

> *I designed it to have some obstacles like P2 needs to activate a lever to allow P1 to continue gathering the collectable. The level won't be mirrored like in Princess Quest as that would cause problems. Princess Quest is single player in comparison to our game which is co-op.*
>
> (Team 2, week 4)

This highlights the use of sources of inspiration for the students in terms of being able to discuss their own designs with reference to existing solutions within games they've played. While working within this mode, students also discussed the importance of combinatory creativity, whereby they combine elements of the design, leading to more suitable directions for their projects.

> *Our original concept was a city that had been evacuated due to an unstable nuclear reactor. The issue we found was designing a city to be unique and easily digestible to the player as most cities are laid out similarly with no memorable landmarks to orient the player. We decided to merge this concept with a sci-fi theme and location. Our team landed upon the idea of having the game take place on a city-sized Mars habitat. This gave us some creative freedom with the level design and the art style.*
>
> (Team 3, week 1)

The above example describes how the team decided to set their game within a city environment as it achieved a number of their design goals. However, combining this concept with sci-fi elements solved a number of their issues by providing a unique aesthetic experience and constraining the game's playable area to fit within their scope. By applying an open-ended design approach, students were able to achieve a solution that solved multiple problems at once. Another aspect of open-ended design was that the students designed for a variety of approaches.

> *We made a google doc with a list of possible endings for the game, this also included the tutorial ending and failed endings. Each ending had a unique plot and a unique set of items that the player had to collect and tasks they had to complete in order to unlock the ending.*
>
> (Team 8, week 2)

This approach demonstrates the value of an open-ended design approach as the students were able to consider the possible outcomes of the game to ensure they provided different experiences to players. This and the other open-ended approaches discussed within this section highlight the value and design outcomes that were produced through a generative design process. The design strategies here often focus on creativity and gameplay experiences, largely dictated by the designers/teams themselves as opposed to external factors. It's also important to note here that many of the approaches interrelate. For example, the student designers created multiple endings through an open-ended approach, while also considering the player experience. The following section will discuss the nature of player experience design as an approach within student design projects.

Player Experience Design

When engaged in player experience design, the students were focused on how their hypothetical player would interact with the game and the world. Here a team describes how they used lighting as a design element to guide the player:

> *Subtle lighting can be used to give hints to the player, for direction within the game world. Players of our game may notice that certain lighting is used to draw the eye to specific game objects, as well as entrances & exits. The hope is that the player will understand the meaning of this visual language, and will use it almost instinctively, creating a more intuitive experience.*
>
> (Team 4, week 5)

This approach can also be based on player feedback and the results of playtesting. Team 3 below reflect on player feedback and consider multiple solutions before choosing one.

> *The people playing our game commented on how the game world felt too empty and would prefer a smaller and more compact space or an increase in player speed. Rather than patching the problem by increasing the player speed, fixing the issue of the map being too empty would be better*
>
> (Team 3, week 5)

This approach to designing focuses on the experience of others and requires the designers to think through how their game is perceived and how they might improve the experience for their players. Aspects of player experience design can also cross over into the game's visual elements and the more open-ended design process discussed earlier.

> *Next thing to look at was the UI. A simple inventory would be great. The inventory would have slots for a coat, boots, and gloves. I suggested there was also a freeze gauge visible at all times on the screen however mechanics on this need to be established. I took some inspiration from stardew valleys inventory where you see your character and slots around it. Each slot has a faint shape of what item goes where.*
>
> (Team 2, week 2)

In the above quote, the student is discussing the design of the UI (User Interface) and how the player will use the inventory system of the game (See Figure 6.4 below). In this example, the student designer is considering a variety of factors, from how players will interact with the interface, how it will look and what inspirations it will take from other games. In addition to this, the designer outlines that they are unsure of exactly how the mechanics will work for



Figure 6.4 Student design work on inventory and user interface elements.

this section of the game, highlighting the co-evolution of problem and solution as discussed in the design literature (Dorst & Cross, 2001).

An aspect of player experience design is how the designers must consider the player's progression through the game and where individual levels or sections of the gameplay fit within the overall experience.

> *As the player moves throughout level, while it is fairly short, this was intentional due to the difficulty found when the play test was occurring, there is a section just before the end of the level that is the same colour as the safe box found in the beginning of the level. I put this here for the player to feel more at ease as they just had completed a difficult portion of the level, this particular part of the level almost acts as a bridge between the two portions of the level that people had the most difficulty with during the play test which prepares the player for the end of the level.*
>
> (Team 6, week 3)

In the above quote, the student designer uses familiar game elements to communicate with the player and make them feel at ease before tackling the more difficult aspects of the level. These DevLogs highlight the significance of the player experience design process on game design in general as students consider how players will engage with the game and adjust the design during development based on player feedback. The following sub-theme of World Design will discuss how student designers work through the process of developing fictional game worlds.

World Design

World design was seen as the process by which game designers are involved in the creation of fictional worlds and settings for their games. This mode of design is quite different to other design disciplines and possibly has more in common with media disciplines. In this area, students designed narratives, art assets, level designs, user interfaces and visual compositions. Each of these is an entire discipline of its own, and often students work between them:

> *I was in charge of designing the characters for the game. This included animating them, building the models and giving them backstories.*
>
> (Team 4, week 6)

In addition to this, the students used aspects from different disciplines to create a cohesive world by combining visual design and level design.

> *We also decided to split the game into different sections, a tutorial, a learning and reinforcement area, and then finally a testing area, each set of levels will have its own colour schemes to make it visually pleasing and easy to understand.*
>
> (Team 2, week 1)

This student shows how level design, player progression, and visual design are all considered as part of a single design solution to create a cohesive design language for the game. In addition to considering the design of the world, student designers consider how specific levels fit within the overall game experience.

> *For my levels I went for a kind of toxic waste kind of theme. A sickly green is what covers my levels followed by a radioactive symbol. This theme also plays into the whole world ending theme so I'm quite happy about it. Since my levels are near the end it is one of the harder levels. Though I don't think the difficulty curve will be too great as we have added more easy levels to soothe the minds of our testers.*
>
> (Team 6, Week 6)

The above extract highlights how the designer has aesthetic and narrative goals for their level that they feel create synergy with their chosen design. However, the student also considers how the level fits with the overall difficulty of the game and its place within the overall theme. This is echoed by Team 7 below.

> *Our team is making a top-down shooting. The art style isn't finalized yet, but the general style is the Player's and enemies' aircraft will be in pixel art form and the background would be a looping image unsure on using pixel art or hand-drawn.*
>
> (Team 7, Week 1)

The student designers, in this case, consider the aesthetic goals for their game in terms of art style and clear goals for some elements; however, other aspects of the game remain uncertain. Given the iterative nature of game design, the world design process is also affected by this. In the example below the student discusses the evolving art style of the game.

> *Currently the art section is in production, however, this weekend we'll be implementing the game functions. the first two images are the white box version of the level and the last image is the current design of the main level.*
>
> (Team 1, Week 3)

The student development log outlines how the game's art style is still in development. However, even while this is in development, the game design and level-building process continues from a grey box to a more refined level design implementation (See Figure 6.5 below).

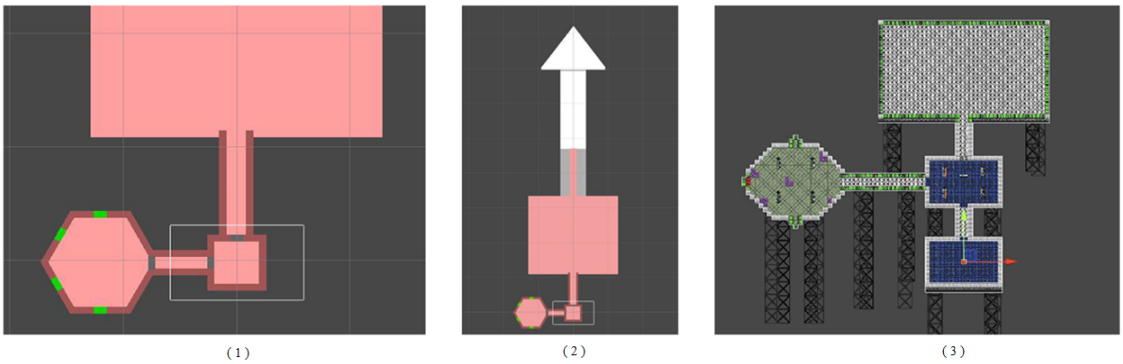


Figure 6.5 Level Design Process showing white box designs (1, 2) and the final design with art in place (3).

Not all teams followed the same process or even similar approaches, with different teams deciding on aspects of their world design at different points. While many teams focused on developing an overall theme for the game this wasn't universally the case.

> *By now we had our finalized idea of what we wanted our game to look like and consist of. We had started the build and now we needed to come up with our storyline and the items the player would be able to interact with.*
>
> (Team 8, Week 3)

Team 8, in the above example, decided on the visual and mechanical elements of the game before considering the narrative and game structure. This is perhaps reflective of different team dynamics, and as outlined in the practitioner interviews, every game design can be different, requiring a variety of different approaches.

This section has outlined the various approaches the students applied to design the worlds of their games, including visual design, narrative design, and level design. Within this mode of design, the considerations of the virtual world and its consistency and layout are the students' primary concerns. The following sub-theme of Technical Design will discuss how student designers develop solutions to design problems through technical implementation.

Technical Design

As outlined in the previous chapters there are numerous interactions between design and technical implementation within video game design. The technical complexity may be due to the use of specific development tools, the experience of the developers or the overarching design goals for the project. Before high-level design can be implemented it is often necessary to implement genre-specific or generic mechanics such as walking, running, jumping, etc. A number of teams discussed creating the base elements of the game, functions expected of the genre or the type of game they were making.

> *During the week, we created a sample project in unity to start developing our gameplay and mechanics. The foundation for the map we used was made last week. While the map is not based on the final version, we wanted to block out the movement, key collection, and other core mechanics. This sample project is a test for our code rather than a demonstration of our game.*
>
> (Team 3, Week 3)

The quote above from Team 3 highlights the foundational supports that students build upon which they'll develop and refine their games. In this example, the team created a basic map that is not an actual level in the game but is built to test out movement, key collection and other mechanics. In game development, this is often called a sandbox or arena in which developers create a playground environment to test games. Shigeru Miyamoto discusses this as the concept of first building the toy before developing the game around that core (DeWinter, 2015). The more unique aspects of the game often build on these core mechanics.

> *I got the ID system in, I could finally get the players to give each other a piggyback, I added an interact button and made some checks to see if both players were colliding with each other then I made sure player one was set as a child of player 2, got rid of their rigid body, so they can't fall, and changed their position so they rest on top of the other player finally when that was done I made another function that would give the player back their rigid body and kick them off the other player.*
>
> (Team 2, week 4)

In this extract, the student must solve several technical challenges to implement custom gameplay. Each challenge solved requires design throughout and creates new design challenges along the way. This can often lead to the design of systems which may be obsolete as the design evolves.

> *I was in charge of making the player controller which I wanted to be grid based. Making it grid based created a lot of issues that had to constantly be fixed. Many clipping issues and the player getting stuck on walls and not being able to progress were worrisome. In the end we managed to fix the major issues together. Now the main reason I insisted on grid based movement was due to certain puzzle that in theory would work better on a grid system however unfortunately these puzzles were cut out due to time constraints and issues with implementation.*
>
> (Team 1, week 6)

This shows how technical design can create solutions to problems that ultimately are discarded as the design evolves and production requirements limit the game's design space. In addition to creating custom mechanics, The technical challenges of game design also interact with the artistic practices of the discipline.

> *This week we have managed to implement the player thanks to our art team and make it move and shoot thanks to our coders! Prototype bullets have been used temporarily to make sure the code is good to go for the further weeks to come.*
>
> (Team 7, Week 3)

In the above example, Team 3 discuss this interaction as a combination of effort between the art team and the coders. Implementing the player within their game requires art assets and code for the movement and bullets. At times the team has used placeholder assets, in the above example using prototype bullets, to test the code prior to the art being created. The technical challenges also include developing code that can be modular to support gameplay functionality.

> *Additionally, I used tags to differentiate gameobjects so that I could use one method that would have otherwise had to be split into multiple scripts for similar*

> *functionality. Specifically for interaction, I wanted to use the same GUI for all interactables to make how you interact more obvious (i.e. press F on PC or X on controller to interact).*
>
> (Team 4, Week 5)

In the above quote, the student discusses creating code that can be modular to accommodate different functionality and allows for a consistent user interface across different controller types. This section outlines the various approaches the students applied to technical design. Within this mode of design, the considerations of the technical challenges, implementations of them and relationships between code and other disciplines are the primary concern for the students. The following theme of Communication and Collaboration will discuss how student designers communicate and collaborate in game development projects.

6.3.3 Communication and Collaboration

From the student perspective, communication and collaboration played a significant role in the development of their projects. Teamwork and negotiating the dynamics of making a game with other students demanded regular communication and collaboration. A significant factor in the approaches students employed within their projects included developing an understanding of their own capabilities and ability to collaborate. Team 4 below describe how roles were allocated across a team.

> *We arrived at an agreement to individuate roles or positions for each team member furthermore such positions included level design, programming, narrative, and environmental design. To ensure individuated roles were non-mutually exclusive and synergetic, we aided each other or oscillated between roles.*
>
> (Team 4, Week 1)

In this example, the team agree to individual roles but also include the opportunity for students to work across roles. Given all students are in the same degree programme (BA in

Game Design) it also provides a self-directed opportunity for students to develop discipline knowledge and game development knowledge in a single project. This process of team roles and allocation of responsibilities also involved students developing an understanding of their own and their team's capabilities in order to scope a project appropriately.

> *When me and my team first started thinking about what kind of game, we should make we all agreed not to go overboard as none of us were exceptionally skilled in coding. We had to make it simple and fun, which was difficult since when you think about the fun video games, they normally include complicated systems. But somehow managed to make it work.*
>
> (Team 6, Week 6)

The student above describes the early stages of the project, where the group wanted to ensure they could create a game on a team where no one was "*exceptionally skilled at coding*". It is worth noting here that all the students are first-year game design students, and their only formal training in programming up to this point was an introductory module on game programming. In addition to this, the prior six weeks of the game tools module introduced the students to the core systems of unity. My expectation as their lecturer was that most students in the class had limited knowledge of coding but knew enough to implement a simple game project with their understanding of the tools available to them. I reflected on this in the fieldnote below as the project progressed.

> *As the project goes on I'm seeing a complex relationship between the intent of the designer, their own experience and their ability with the tools to deliver on their design goals. While this often leads to useful design constraints it can cause stress and frustration as students attempt to tackle design problems that are complex to implement and then come up against failure.*
>
> (Fieldnote, 4th April 2022)

The above fieldnote was from the third class of the project, and after reflecting on the class and tutorials, I was wondering how the balance of ability vs goals would play out over the remainder of the project. When it comes to organising group work, a student from Team 2 below describes their role as the producer on the project.

> *I made sure everyone knew how the Trello page functioned so that all users in the team could edit and add stuff as they pleased. I also got into a discord call and showed them how the GIT repo worked so that they could access the unity project at any time.*
>
> (Team 2, Week 1)

The above student discusses their role in terms of organising the project for the rest of the group. The role, while similar to the producer role in commercial settings, also involved creating a GIT repository that would facilitate team collaboration. In this way, the student producer takes on both a technical and project management role in order to support the other students working on the project. The student design project, however, can create additional challenges, as outlined by Team 1 below.

> *I would like to talk about the process of making the art of the game and how we overcome these challenges, we initially started with 4 people in the group that we would divide the project into the programmers and designers. I was in charge of the background and environment design, however, we were left with just 3 people in our group project. We wanted to have different areas of the game we initially had 5 areas we wanted to explore but due to time constraints we had to cut the levels to just 3 levels.*
>
> (Team 1, Week 6)

In the above quote, the student describes how a student left the programme during the project, and their group size decreased. This increased each team member's individual responsibilities and resulted in a reduced scope for the project. Despite the reduced scope, the student was happy with the project they completed and how they "*weren't afraid to make difficult choices such as scrapping or changing parts of the game*". Another student discusses the importance of level design as a discipline for collaboration in the game development process.

> *Level Design is the glue that ties all elements & mechanics of a game together. Even with stellar mechanics and systems, poor level design can turn an engaging and compelling experience into a rather dull one. In my experience, at least, the*

> *level designer should work closely with the artists and designers to produce the best levels they can - ones that both please the mind, and the eyes.*
>
> (Team 4, Week 3)

This student highlights the role of level design as an area of game design that ties the different aspects of game development together. For this student, level design serves a synergistic purpose where the players can engage with the content that the team have created. However, level design brings its own challenges and depends on individual students' capabilities and experience.

> *At first I wanted to design the exterior, but figured that it would most likely not be shown in-game. I personally find the designing interiors is one of my weakest areas when it comes to concepts, as the thought that goes into designing the areas to feel lived in while having valuables and possessions a person would have is not something that comes naturally to me.*
>
> (Team 2, Week 1)

This student highlights how they don't feel that the design of interior levels is a strong point, but as a small team project, they were required to fill that role.

This section has discussed the various factors that impact communication and collaboration as core aspects of the development process. While discussing communication and collaboration, the students discussed both teamwork and their own contributions to it. The following theme of Initiating the Game Design Process looks at how student designers either initiate the design process themselves or through external stimuli.

6.3.4 Initiating the Game Design Process

The design literature often describes the design process as a co-evolution of problem and solution (Dorst & Cross, 2001). As a result of this phase of the fieldwork, however, I use the terms initiation and outcome as opposed to problem and solution to capture the nature of the game design practice. While much game design activity is focused on problems and solutions,

many students also designed in more open-ended ways, initiating the design process from a conceptual standpoint as opposed to problem framing. The initiations sometimes came from the designers themselves and at other times were initiated based on seeing player feedback or as a result of testing the game internally. Team 2, below, describe how this conceptual framing can unfold in the context of game design.

> *The last thing I worked on was the temple design. I took huge inspiration from Sable as the architecture of the temple is easy to see and very grandiose. The temple design I had in mind was circular and had a statue in the center. However, this posed to be an issue as our game was 2D so having the circular shape wouldn't portray the same effect as hoped. So I decided to take a look at a 2D game with temple-like structures.*
>
> (Team 2, Week 2)

This extract highlights several key points of design initiation. Firstly, the student initiated design by being inspired by the game *Sable* (Shedworks, 2021) as they developed a concept for a temple within their own game. This leads to a problem as the game they are making has unique requirements that differ from the inspiration source. The student moves from conceptual idea generation and inspiration to problem identification and finally to a solution focus. The design essentially moves from the high-level conceptual frame to the more grounded problem-solution framing approach common within other design disciplines. A similar challenge was encountered by Team 4 and is outlined below.

> *Though an isometric view was originally planned, this changed as development progressed into a free-cam view. Needless to say, this affected level design, as certain areas of the map were designed with "open areas/walls" so that the player could originally see where they were going and what they were doing. These spaces, however, in third person view, felt more like walls that were forgotten about. Obviously, this needed to adjusted for the final product.*
>
> (Team 4, Week 3)

In this example, the initial concept and design focused on an isometric camera perspective, but as the project moved through development, the team moved from this to a player-controlled camera through the process of implementation and iteration. The changes they

made in development created a problem with the level design that would have to be addressed through the design process. Another example of self-initiated design is discussed by Team 6 below.

> *This is our final year project for one of our modules. We wanted to make a game that is simple but fun to play. The theme of this project was "The World Ends In 5 Minutes". The concept of the game is you must try to get through each level within 5 minutes, and each time you fail the timer will take away 5 seconds from the clock. But we decided on making the clock metaphorical to not put too much pressure on the player as well as extra frustration. This game would essentially be considered a maze game. Each time you touch the walls you die.*
>
> (Team 6, Week 5)

In this extract, the team clearly outlined their goal for the project in terms of focusing on a simple and fun experience. Despite initially considering designs that took the brief literally, the team opted to take the idea of a timer as a metaphorical element of their game. However, even with this simplification, they also added constraints of forcing the player to restart whenever they touched off the walls.

> *Another thing we added is a stage timer, which will count down while in a level as the theme is that the world will end in five minutes and so each level will be five minutes and you have that long in each level to finish it and push back the alien invasion that has plagued our planet.*
>
> (Team 7, Week 5)

Team 7 took the timed aspect of the brief literally and used it as a mechanical and narrative element. The brief served as the jumping-off point for their design and allowed them to consider where they could create an engaging experience for players. An external source of design initiation can come from the playtesting process as described by Team 3 below.

> *We found that the player may spend most of the loop travelling from one side of the map to the other. Our plan for this problem is to implement a transport system (i.e., cars/trains). The map's design has gone through a few iterations.*

> *Our first idea was to have a central hub with branching areas. We felt that the map might hinder the player's movement as the player can only travel in straight lines.*
>
> (Team 3, Week 4)

In the above extract, the team discuss uncovering an issue in their design that was negatively affecting the player experience. This served as the initiation of a design process and led them to consider adding a transport system to solve this issue. It is interesting to note here that the team describe how the level design has undergone several iterations at this point; however, this issue only became apparent through external playtesting. It is also notable that the solution, in this case, is technical, requiring the implementation of a new transport system to solve a level design problem. This highlights the interconnected nature of game development projects and the multifaceted approaches developers can take to solve problems. Team 5 below similarly discuss the value of the playtesting process to gather feedback and make design issues visible.

> *When we had our play test for the game, we were told that the movement system was very unlike a platformer, since the character had too long of an acceleration time, as well as a deceleration time. An issue of the player sticking to walls was also brought up, which previously went unnoticed by us. I decided to completely redo the player movement system and I believe it is more up to par for a platforming game.*
>
> (Team 5, Week 4)

A number of issues with the core gameplay only became apparent to the team following the playtesting session. The issues primarily related to the player controller and how it didn't feel in keeping with the genre. The student decided to redo the system to make the player movement feel more appropriate to the genre. Design initiation can also lead to uncertainty in the design process, as Team 1 discuss below.

> *Another issue still present in the flower puzzle level is that if you get the order of the flowers wrong, you cannot repeat the puzzle. I have attempted to fix this, noticing that the bool to mark the order and the script that sets the bool to false*

> *was working, but when trying to interact with the flowers again, the bools were not being set to true anymore.*
>
> (Team 1, Week 5)

This issue was preventing players from solving the puzzle and progressing in the game unless they got it correct the first time. As the lecturer, I found this DevLog interesting as the team hadn't discussed the issue with me before this. Once they brought the issue to my attention it was possible to show them ways to track puzzle progress. After working through the problem and the solution with the students, I reflected on the following in my fieldnotes:

> *X asked me to help with an issue they were facing in their game earlier. They had a puzzle that had to be completed in a set order, but their code wasn't tracking it properly. When I first sat down, I didn't quite understand the issue and it took some discussion to tease out what they wanted the outcome to be if a player got the puzzle wrong. For example, they hadn't considered what would happen on the first wrong input, should it immediately notify the player or should that only happen after the player has completed all 3 inputs? It's interesting for me how the design of this puzzle was only considered from the perspective of the correct order, but the students hadn't fully considered how to communicate with players who got it wrong.*
>
> (Fieldnote, 25th April 2022)

While the solution wasn't technically very difficult, it required the students to think through the design of the puzzle from multiple perspectives and consider the outcomes. It is similar to "*The Door Problem*", described by Liz England (2014) as the chain of game design decisions that follow from the decision to have doors in a game. What seems simple at first leads to complexity through the number of questions it asks of the game designers.

This section has discussed the nature of game design initiation as the process of initiating design activity. This can come from either high-level conceptual idea generation or more grounded problems encountered from the brief or playtesting and iteration. This section highlights the nature of game design activity as solutions to design problems or implementations of design concepts, often leading to a cascading flow of design decisions

that follow. The next section will discuss the final theme of Game Design Outcomes and looks at how the design process leads to different outcomes throughout a project.

6.3.5 Game Design Outcomes

Within this study, the students often reflected on the outcomes of their design process. In particular, they reflected on challenges they hadn't overcome but accepted as part of the design due to the constraints of the project, and they also reflected on the opportunity to develop design expertise. Similar to the previous theme, where I used the term initiation to cover a broader range of design starting points, here I use the term outcome as opposed to solution as it also covers unsatisfactory and incomplete outcomes. Team 7 below discuss two different design outcomes from their project.

> *Also, the score system we had thought of adding in will take too long and we've had to remove that too which is another shame but not that important in the grand scheme of things. However, we did manage to get the boss drawn once again thanks to our amazing art team, and added into the adventure which came out amazingly.*
>
> (Team 7, Week 6)

In the above extract, the team discusses how a scoring system they had envisaged is no longer going to be developed; interestingly, they realise that this system may not be important to the overall project. The expertise being developed here is similar to the pragmatic design approach discussed by practitioners in Chapter 4 (The Practice of Game Design). The students must understand the trade-off between their design vision and what is achievable within the available time and team experience. Additionally, the team discussed a successful design outcome of the project where the final art for the end game boss was completed and met their design goals. While these reflect different outcomes they also reflect the development of design expertise by the student team. Team 4 below discuss a similar outcome.

> *Due to unforeseen series of circumstances moreover a collection of other elements, we decided to shorten our game vision in order to complete and enable it to function. It follows that four originally planned levels including the opening level, were decreased to two levels, of which are the space station, and the scientific facility.*
>
> (Team 4, Week 6)

This quote again focuses on the need for the team to reduce the scope of the project. In my own experience as an educator, it is common to encounter student teams who over scope and need to reduce aspects of the project substantially to reach their deadline. The consequences of this outcome can affect the entire team or unevenly impact individual team members, as outlined below.

> *Though we made good progress on our game in many respects, we unfortunately did not have to time to implement one of the other environments that I produced myself ; that being, the office scene in the facility. This scene was planned to have more lore and other story-related items.*
>
> (Team 4, Week 6)

The above quote highlights the impact that reducing scope can have on individual team members and their contribution to the overall project. While this scene was cut from the game to ensure the team could submit the project, it impacted the gameplay experience and the work of this student. Having made the scene and developed much of the narrative for this level, the student is left with a smaller contribution to the project due to production demands. The challenges of team-based game development projects are evident here, and it raises the question of how this contribution could be considered relative to the other team members. Some design outcomes serve the dual purpose of simplifying the game design while also improving the player experience.

> *Some more advancements we made this week was to finally create a proper sprite for the health of the players. We decided to go with the classic set of hearts that disappear after getting hit rather than a life bar. This decision was made to simplify more the gameplay because now the player knows that every single shot will deal the same amount of damage.*

(Team 7, Week 5)

This highlights how simplifying design elements can lead to improving the game. In this case, instead of a health bar that might track health in a range from 0-100, they used a simpler heart system that made their scope more manageable and improved communication to the player. Reflecting on the completed project, one of the members of Team 5 discusses how they feel the game turned out.

> *Personally, I feel like more could have been added to the game, for example a boss fight at the end of each level to progress to the next, however I am pleased with the overall feel of the game and how it plays. If I could go back and change anything it would be the movement system which I created. I feel that it is lacking in something, however my current knowledge of unity scripting is not of a high enough standard to make any major improvements at this time and I also wanted to keep from using too many tutorials, as then it wouldn't feel like I've learned anything and I would feel like I didn't create enough by myself.*
>
> (Team 5, Week 6)

For this student developer, there are aspects that they are happy with and those that they believe could be improved. While the student is happy with how the game feels, they also believe that their final game could have included more content and that they could have achieved a larger scope. In the previous theme of Initating the Game Design Process in Week 4, this student discussed how the player feedback had led to reworking the movement code. However, they still remain unsatisfied with the final outcome and would like time to improve that aspect.

As previously outlined, practising designers often work within these cycles of implementation and iteration where systems are modified, evaluated and refined throughout development. The nature of a 6-week student project prevents this deeply iterative development from taking place as the potential cycles of iteration are reduced. While the student felt that they didn't want to rely on supplementary resources, other teams described the benefit of working through technical problems.

> *The first few iterations of the interaction code were a disaster, with some not working at all and some causing countless other problems to pop up within the other code. It took a lot of effort and very little sleep in order to get a basic interaction mechanic working in time for the playtest but we did it! Now that the two main mechanics are working we've to keep working on the scripts for the endings as well as some other important elements of the game. After what we went through with the interaction code I think we're well able to handle whatever happens with this code!*
>
> (Team 8, Week 4)

Team 8 describe encountering numerous issues with the implementation of their game. However, from the extract, it's clear that this process of struggling through the process led to valuable learning and a deeper understanding of how to implement gameplay features. The outcome of this process led to more confidence and competence in terms of developing future features for their game. However, this quote also highlights elements of crunch culture (Weststar & Dubois, 2022) with the students sacrificing sleep for the project goals. This suggests that the project by its nature and similarity to the development process may lead to the negative working patterns reported in the industry. Many students discussed the development of technical competence in their final evaluations, such as Team 3 below.

> *I felt that my coding ability greatly improved due to the hours I put into the item inventory system, the key-coded door (which unfortunately wasn't implemented but is accessible in the centre of the map), and having clean code (that is each in its separate class). I believe that my ability to create consistent and clean art for the game environment greatly improved, and am most proud of my progressing skills in lighting a scene. I felt that my ability to design levels has improved greatly, and I'm proud of the teamwork we were able to achieve.*
>
> (Team 3, Week 6)

This student describes how they feel their competence in programming, art, lighting, and level design has improved through the project. As outlined in the previous chapter the game design project serves as the signature pedagogy within the game design classroom. While it is possible to isolate aspects of the process it is also worth acknowledging that many game design challenges occur due to the complexity and interrelated nature of the process. By

developing projects that incorporate the multi-disciplines of game design activity, students develop competence across a range of skill sets as opposed to isolated disciplines. Similarly, Team 3 discuss the value of the project as getting more experience with production.

> *As we completed our game or all we were able to achieve in the time period, we learnt a lot from the process. Firstly, we realised as we neared our deadline that we were far too ambitious with our game's vision. The game would have needed a few more days to have been completed, something that could not have been done due to all our other college work. Going into the second year, we have all learnt the valuable lesson of assessing our time limit and making a game suitable for the deadline.*
>
> (Team 3, Week 6)

In the above extract, the student reflects that their initial vision was beyond the scope that they could achieve in the time available to the team. This has led to them developing expertise in game production and getting a deeper understanding of how to appropriately design projects according to their available timeframes and capacity. Essentially, they learned valuable lessons in terms of pragmatic design approaches similar to those employed by design practitioners. Finally, the process of making games can be fun and rewarding to student designers, as outlined below.

> *Over the course of the 2 months while creating this game with my team, I think we all can say we learned something new and had fun creating this little project. Seeing the positive feedback from our class peers made us feel very happy about what we created.*
>
> (Team 6, Week 6)

The game design project provides a rich learning and personal development opportunity for students and allows them to take ownership of their own learning. Being able to produce a game that they can reflect on fondly and consider the feedback they received from their peers can help them develop as reflective and critical game design practitioners.

This section has discussed the theme of Game Design Outcomes from student game design projects. While not all outcomes are desirable or solve the problems, the student

designers were generally accepting or positive about the process they followed. In this section, the game design project as the signature pedagogy of game design education has been shown to be a rich learning environment leading to valuable and integrated student learning outcomes.

The following section will conclude the chapter and discuss the themes that emerged from this research within the context of the previous chapters.

6.4 Conclusion

This phase of the research sought to answer the question:

> *RQ 3: In what ways do students apply game design approaches within game development projects?*

The research presented in this chapter sought to better understand how game design students work within game development projects. A framework of the student design process was developed from observational data and grounded analysis. The framework presented in this chapter shares similarities with the practitioner and educator approaches from the previous chapters but also differs from these. The findings from this study added to the following research contribution:

> *RC 2: An account and interpretation of game design learning in higher education.*

The core experience of the student designers was with the Context and Complexity of Game Design. The study highlighted the significance of the design context on design projects, specifically the role of teamwork, production and technical/artistic challenges. These contextual factors often set constraints on the design space students were operating in due to a lack of consensus, time and/or skill. I found a complex range of design activities

from open-ended design, player experience design, world design and technical design. These activities often interact with one another and highlight the intertwined and multidisciplinary nature of game development.

Specifically, this shows the complex demands in terms of expertise placed on students. The role of communication and collaboration within student design projects focused on communication among team members and collaboration across disciplines. The process and experiences of students highlighted a limitation in the problem-solution framing presented in traditional models of design (Dorst & Cross, 2001; Lawson, 2010). During the study, it was found students were often opportunistic, not responding to a problem but seizing on a chance event to improve their game. Similarly, the students described design outcomes that sometimes fell short of being a solution and often encountered issues that they deemed undesirable but acceptable in the context of their game.

Given that design projects are a common component in many game design programmes (Czauderna, 2018), the complexity is important to consider as educators. As outlined by Larsen (2018), the game design process can be difficult to teach and presents challenges to educators. Students learning to design games must learn the skills to make fully realised games to hone their design skills. This presents a challenge to game design educators who develop curricula to teach these skills while also aiming to develop students' creative potential. As outlined by Whitson (2020) the development of video games is a "*messy*" process, and this study has shown the complexity of design approaches required to develop student game projects.

The results represent insights from a single group project over the course of six weeks and they help to illustrate the challenges our students face, given the multidisciplinary nature of game design. From field notes, I saw students move from initial design to concept in a short period of time. This short ideation phase is at odds with other design disciplines.

> *The class responded well to the brief and were instructed to focus on generating a volume of ideas before picking one to develop further as this would increase the likelihood of an original design, they were also instructed to look for enthusiasm for ideas from the team as an indicator for design potential. After a short break, I met with each group to discuss their concept and answer any questions. Almost all the groups had already picked a concept to develop further at this point (approx. 30 minutes from initial briefing) and were slow to start generating concepts again as they felt the ideas were interesting, despite some of them sounding generic in terms of concept description. I provided feedback to explore the possibility space but many teams were hesitant to do more than refine existing the concept. [...] The process the students followed is in contrast to my training as a product designer where we initially generated a volume of ideas before narrowing them down to favoured concepts but I have repeatedly seen this since I started teaching game design. Many of the concepts were quite generic with little originality and often lacked a clear creative vision, I wonder if this is a consequence of such a short project timeline or their relationship to games as players or something else entirely.*
>
> (Fieldnote, 21st March 2022)

This may be a result of the pressures and complexities placed on students to deliver a playable game within the project timeframe and suggest game design curricula may need to consider how to support ideation as a key skill for game designers. Reflecting on this fieldnote, having analysed the student DevLogs and the previous studies, I believe a number of factors may be at play. The timeline for this project was short, and the students' visions were ambitious in terms of trying to emulate aspects of commercial games.

This study provided insight into the game design learning experience from the perspective of students. It suggests, in combination with the previous chapters, that traditional models of design may fail to capture some of the inherent complexity of the game design process. The findings led to the development of the game design learning model (Chapter 7: Supporting Game Design Learning). The model extends Lawson's model of the design process (2010) by moving from problem-solution to initiation-outcome and by framing the model within the design context. In addition to this, it provides insight into the nature of the analysis, synthesis and evaluation activities of game design.

The study also adds to existing research on game development education by providing observational accounts from within the game design classroom. These accounts provide insight into how game design learning takes place and the nature of student game design activity. In particular, they highlight the disciplinary complexity of game design education and add to a growing body of academic work exploring the nature of game development in higher education (Bergstrom, 2022; Harvey, 2019; Keogh, 2023).

The following chapter will discuss the game design learning model that was created following this phase and the supports developed based on these findings.

Chapter 7

Supporting Game Design Learning

This chapter describes the game design learning model and the implementation of three supports in game design education that were created as part of this research. The supports included:

- An online tool developed to support students in the ideation process of game design. The *Game Ideation* tool aimed to support students in developing ideation skills and build an awareness of how other game designers approached similar challenges.
- A learning unit focused on broadening perspectives on equality, diversity, and inclusion by examining a game made by a local game studio, Dreamfeel. The support explored how a small Irish studio foregrounds inclusivity as a core design principle and how narratives of game development often obscure the diversity of work produced within the field.
- A module re-design focusing on a broader understanding of the design process and allowing space for design expertise to develop. This support aimed to broaden the structure of game design learning to provide more opportunities for learners to engage in authentic designerly activity.

These supports aimed to address challenges in game design education in response to the insights uncovered throughout the research project. While the previous fieldwork chapters involved the study of the game design process through interview and observational methods, this research component sought to change the configuration of game design learning within my classroom practice. This phase of the research draws on the DRM Methodology (Blessing & Chakrabarti, 2009) as it seeks to improve and support the design process. As this phase of the research represents initial interventions within the DRM approach, the data sources in this section come from fieldnotes and reflect my experiences with these interventions.

7.1 Objectives

The objective of this study was to answer the research question:

> *RQ 4: How might a model of game design learning aid in the development of classroom supports for the acquisition of game design expertise?*

The goal of this phase was to synthesise the fieldwork findings from previous chapters into a model of game design learning. Following this I sought to support improved design outcomes within the game design classroom. The study seeks to explore the potential of educational interventions within the game design classroom and reflect on the outcomes of these approaches.

7.2 A Model of Game Design Learning

The model of game design learning (Figure 7.1) builds on Lawson's (2010) general model of the design process. The model was developed based on the findings of the literature review and fieldwork. An early version of the model was presented at the *Digital Games Research Association Conference* in 2022 (DiGRA 2022) based on the literature (Healy &

Cullen, 2022b). This was then iterated and developed further based on the findings from the fieldwork.

The activities at the centre of the model- analysis, synthesis and evaluation relate to the approaches designers apply within their work. These approaches are applied between initiation and outcome in an iterative manner through implementation. Finally, the process takes place in a wider context, often involving communication and collaboration as well as the structuring and outcomes imposed on the process by academia.

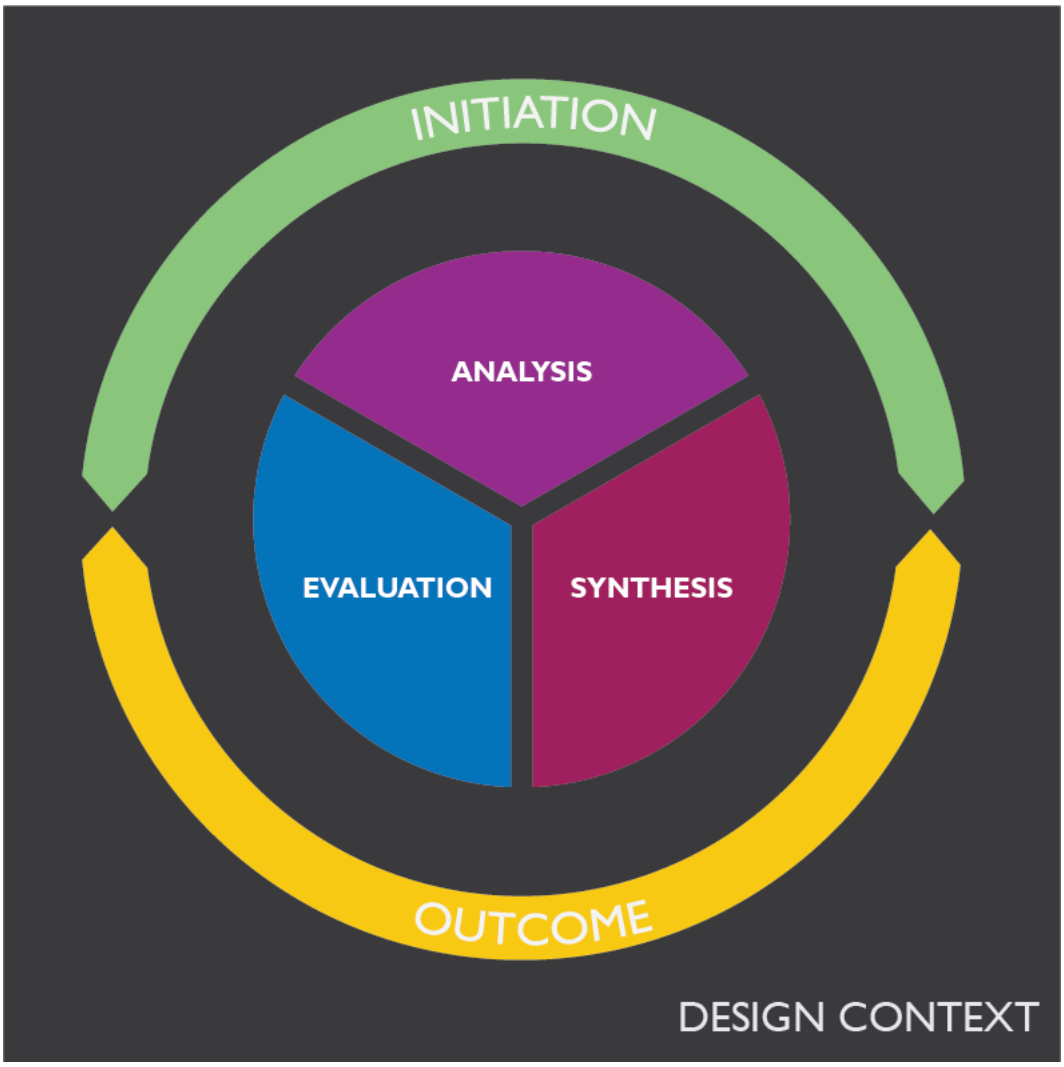


Figure 7.1 The Game Design Learning Model. Authentic design experiences exist between design initiation and outcome, involve analysis, synthesis and evaluation, and finally occur within a design context.

This model considers the flow of game design learning at a micro level where students are iterating and generating designs. The model moves through iterative cycles of analysis, synthesis and evaluation and can occur on various scales, from sketching solutions to potential problems to developing prototypes and systems to test and evaluate solutions. The model is not intended to prescribe an order or structure to game design activity, instead, it seeks to act as an aid to understand and support learners through the complexity of the game design process.

Figure 7.2 below provides additional details of sample activities that educators may consider relevant to each component of the model. While they are not exhaustive lists it is hoped that this may clarify to the reader the nature of the designerly activities at the core of the game design learning model.

Table 7.1 provides a more detailed overview of the elements of the game design learning model and examples of the factors associated with each element in higher education.

By looking at game design learning through a process model we can identify how activities within the design process might interrelate with one another and identify areas for further study. A student may immediately develop a prototype and be inspired to add a new element, which might lead them back to analysis to better understand the new concept or idea based on previous experience. In this way, it does not dictate a way to design but rather a way to understand the process of game design learning.

The final model serves as a descriptive tool with specific intended purposes and audiences in the field of game design education. It is designed to enhance the understanding of game design learning and provide guidance for the development of tailored classroom supports within higher education game design programs.

The primary purpose of the model is to aid in the understanding of game design learning processes. It provides educators, researchers, students, and design practitioners with a comprehensive and descriptive framework to comprehend how game design education

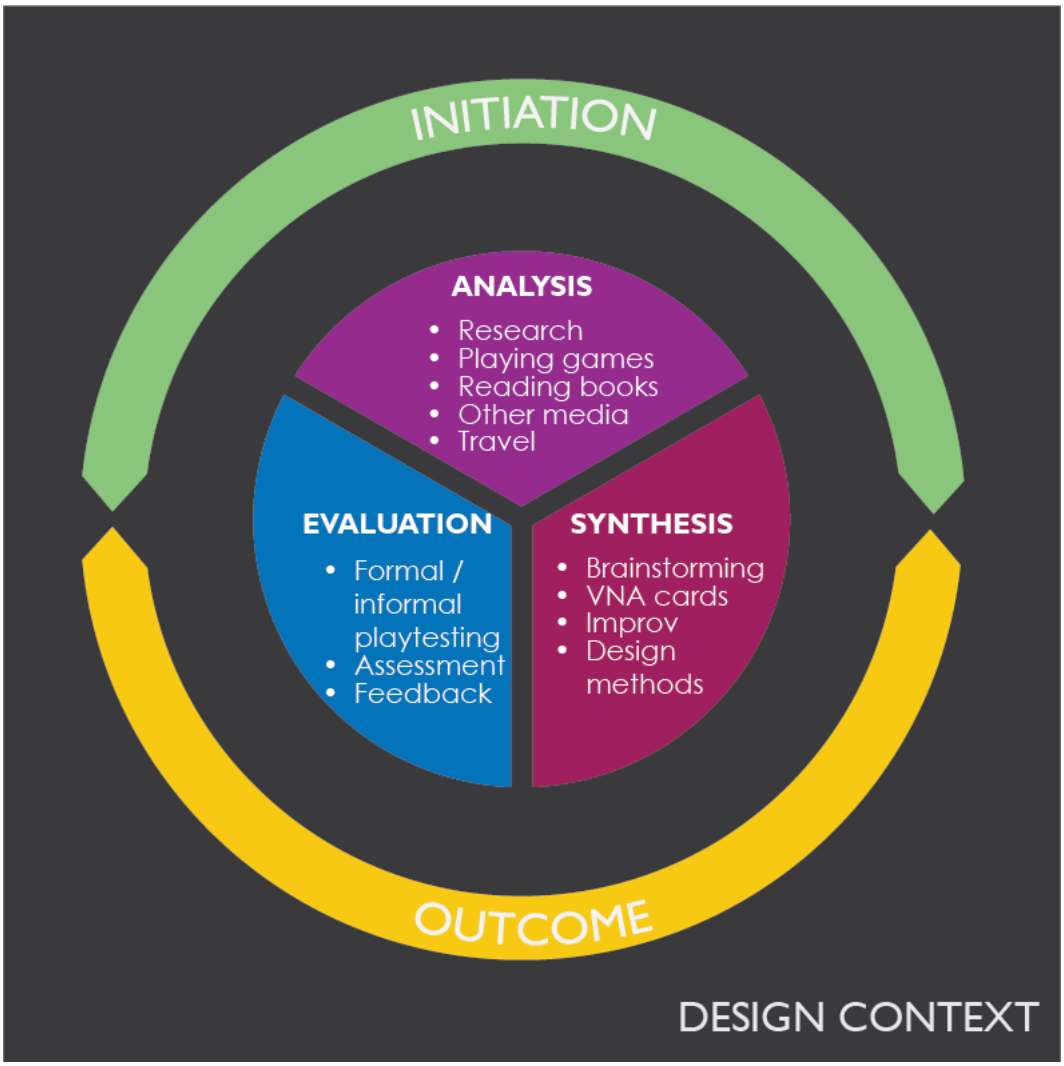


Figure 7.2 The model of game design learning presents activities as examples of designerly activity within the design process.

functions. The model delves into the complexity of the learning journey, offering insights into the diverse approaches, skills, and knowledge applied within game design practice.

The primary audience for the model is educators involved in teaching game design in higher education. Educators can utilise the model to inform their teaching practices, curriculum design, and assessment methods. Educators may use the model as a foundational framework for designing and structuring their game design curricula. It aims to identify core

Table 7.1 Elements of the game design learning model and examples from practice.

Element of the Game Design Learning Model	Examples
Analysis	Research, playing games, reading books, watching movies/TV, travel
Synthesis	Brainstorming, VNA cards, improv, design methods
Evaluation	Formal and informal playtesting, assessment, feedback
Design Initiation	Project brief, playtest feedback, design goals, bugs
Design Outcomes	Project submissions, developing expertise, successful implementations, experiencing the process
Design Context	Collaboration, communication, individual experience, team skillsets, "gamer" identity, time available

aspects of game design learning enabling educators to create effective and well-rounded programs and supports that prepare students for success in the game design industry.

Researchers may employ the model as a tool for studying game design education. It offers a structured foundation for investigating learning processes within game design programmes. The model provides a common language and framework for researchers to compare and analyse educational practices.

Students pursuing game design can use the model to gain a deeper understanding of their educational journey. It may allow them to identify the core competencies they need to develop and grasp the complexity of the game design process for their careers after graduation.

For design practitioners seeking to enhance their skills, the model offers insights into the broader context of game design education. Designers can use the model to explore areas where they may wish to develop or areas that align with their career goals.

The primary purpose of the model is to enhance the understanding of game design learning. It also supports curriculum development, research, student awareness, and professional development. The model's intended audience includes educators, researchers, students, and design practitioners, ensuring its relevance and value to all stakeholders in the game design education ecosystem. The following section presents the supports developed in this phase of the research.

7.3 Game Ideation

The first support involved the development and initial evaluation of a tool to support game design student conceptualisation. The tool was developed as a response to classroom observations such as those discussed in the previous chapter and based on educator findings that suggested students may often under-explore the possibility space of the game concepts they are developing. The tool is called *Game Ideation* and was initially developed based on the work of design heuristics (Yilmaz et al., 2010) within other design fields. The intervention was presented at the *Digital Games Research Association Conference* in 2022 (DiGRA 2022) at the workshop on *Game Design Patterns* (Healy & Cullen, 2022a) prior to being iterated upon on trialled within a module at TU Dublin *Game Tools 2* . The module is a follow-on from the Game Tools 1 module where the observations discussed in the previous chapter were conducted.

7.3.1 Background

The development of a game ideation tool emerged from an observation of students' behaviour in the classroom. Students were predominantly fixated on the implementation aspects of game design, often neglecting the designerly process and not engaging in the stages of design analysis, synthesis, and evaluation. In response to this observation, an intervention was devised that aimed to address this issue and to empower students to engage more meaningfully with the entire design process.

The classroom observations revealed that many students, while enthusiastic about creating games, were prematurely focusing on the technical aspects of design implementation. Students gravitated towards coding, creating assets, and building games in engines, but they were doing so without spending time exploring the design space. In my observations, this tunnel vision towards implementation often resulted in projects that lacked depth, innovation, and overall coherence. To consider how a support may be developed I looked at the design learning model and felt students would benefit from a support that highlighted the significance of design analysis, synthesis, and evaluation in the game design process.

The game ideation tool was conceived as a support to address this observation based on the model developed earlier in the research. It aimed to provide a structured and supportive framework to guide students through the critical stages of design analysis, synthesis, and evaluation. It encourages them to explore the problem space thoroughly and identify key challenges they will address in their game. It pushes students to explore a wide range of potential solutions before they settle on a specific game concept. This phase encourages designerly thinking and aims to help students generate novel game concepts. By guiding students in this process, the tool helps them refine their concepts and ultimately create more compelling games.

As outlined in the literature games are inherently a creative discipline, yet much of the design advice offered for the generation of game concepts boils down to some form of brainstorming. The effectiveness of brainstorming as an approach to idea generation is the subject of debate and suggests there may be a benefit in looking beyond this to other ideation techniques (Daly et al., 2016; Keshwani et al., 2017).

In other design fields, there are structured ideation approaches which have been shown to improve ideation effectiveness, especially among novice designers who may be subject to design fixation. Design fixation is a form of cognitive bias whereby designers become fixated on potential solutions or problem framing and fail to fully explore solutions to problems that might be more desirable than the fixated solution (Youmans & Arciszewski, 2014). This topic is well-explored in engineering, product design, and architecture but has received little attention within game studies. Design heuristics are a form of cognitive tool used by designers during the design process to improve the design outcome. Yilmaz and Seifert describe design heuristics as follows:

> *The term heuristic implies that it: (1) Does not guarantee reaching the best solution, or even a solution; and (2) Provides a "quick and dirty" (easier) method that often leads to an acceptable solution. We propose that design heuristics may guide the designer's exploration of possible solutions by varying product characteristics or elements to create novel designs.*
>
> (2011, pp. 385-386)

This aim of seeking an "*acceptable*" over an optimal solution is what makes heuristics distinct from other forms of design strategies such as design principles and guidelines (Fu et al., 2016). As discussed in Chapter 2 the design of games is generally open-ended (Berg Marklund et al., 2019) and the use of heuristics is well suited to design problems where optimal solutions may not exist. Heuristics allow the designer to "*jump to a new part of a very broad problem space of potential solutions that may never have been considered*" (Yilmaz et al., 2010, p. 339).

Several studies have been conducted on the effectiveness of design heuristics. Christian et al. (2012) conducted a study on the use of design heuristics in an introductory engineering course and found that their use "*supported the generation of novel design possibilities, and the confirmation and extension of existing design ideas*" (p. 25). A study by Kramer et al. (2014) found that heuristics had benefits across a variety of phases during a design project and were effective at supporting teamwork and idea generation. This research shows that heuristics can be effective in the domain of product and engineering design. This intervention seeks to explore the suitability of applying a heuristics-based approach within the game design classroom.

7.3.2 Implementation

Game Ideation was developed to support students in the idea-generation process and to help avoid design fixation. The tool is based on the design heuristics research discussed above. An example of early concept work for the physical heuristics cards can be seen in Figure 7.3 below. This concept would have involved a double-sided deck of cards similar to *Design Heuristics* (www.designheuristics.com). One card face would show an abstract representation of the design heuristic and a description, while the other side would show an example of a game that implemented the heuristic and a brief description of how it was applied.

As the initial planning took place during heightened COVID-19 restrictions, the physical cards were not developed further in favour of a digital approach. An online tool was chosen for its suitability- not requiring physical components and being accessible remotely with minimal incompatibility risk and functionality on mobile devices. Another benefit was that it could allow limiting information based on user preference and would allow for additional game data and animated gifs that could show the heuristic in action.

The heuristics set was developed by reviewing the Independent Games Festival Award (www.igf.com) nominated games to identify a set of game design heuristics. Details of the

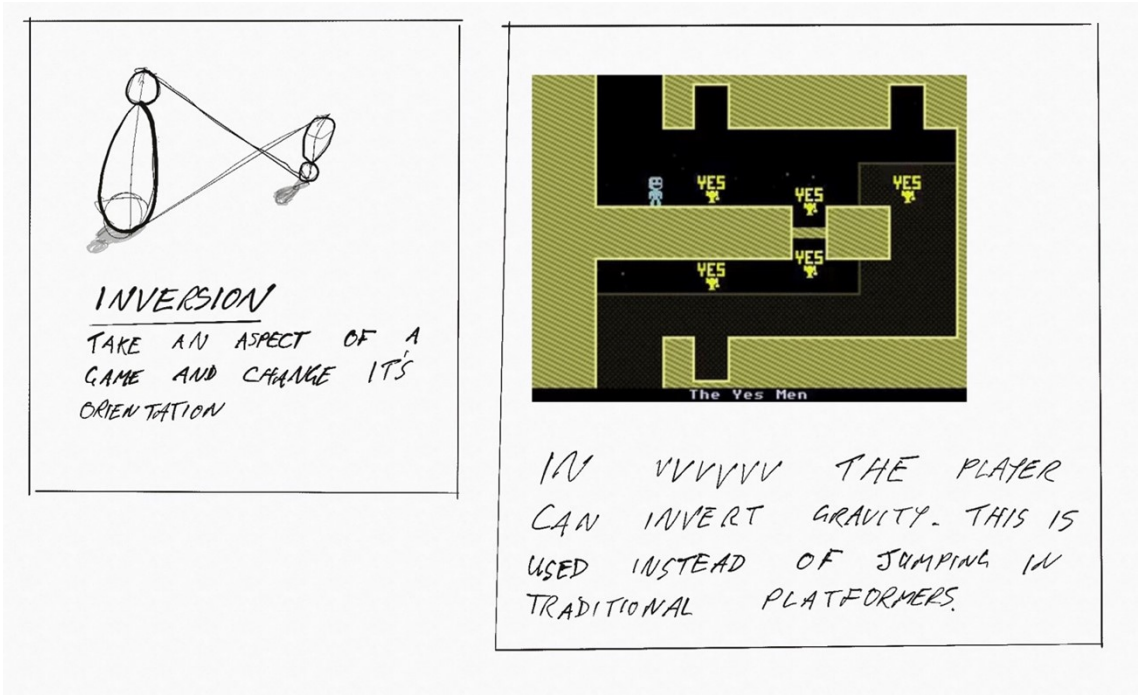


Figure 7.3 Concept development for physical game ideation cards.

data gathered on each game and the development of heuristics are included in Appendix H: Development of Initial Game Design Heuristic Set. The heuristics developed through this initial process were:

- Adjust the Challenge
- Consider the Genre
- Design for Control
- Design for Player Freedom
- Manipulate Time
- Refine the Narrative
- Think of the Emotional Impact
- Use Custom Mechanics

- Use the Environment

Each heuristic was identified as an approach that the designers of award-winning indie games had used to design critically successful games. These heuristics are intended as prompts for game designers to consider aspects of their design that might be improved through their application. The game design heuristics are an initial set that was developed to test out the application of design heuristics to the game design process. The aim of the heuristic set is that designers, and student designers in particular, could use these as a way to prompt creative exploration of their game concepts. As they are developed from data gathered on successful games, they suggest ways that learners can apply the expertise of more experienced designers.

To develop the initial intervention, a single heuristic, *Design For Control* , was selected in order to develop the prototype tool. This heuristic was chosen as it was well represented in the data set across the games that were analysed. In addition, I felt students tended to under-explore how their games were controlled, often reverting to simple movement patterns and relying primarily on the keyboard and mouse. My hope was that by using this heuristic, more students would invest time considering their gameplay controls. Figma (www.figma.com) was used to develop the prototype tool as it allowed the functionality to be implemented, and a working wireframe of the tool could be shared with others. The homepage of the Game Ideation tool was kept simple, with a single button prompting the user to begin the ideation process. While the prototype only had a single heuristic in the final version, this button would randomly provide a prompt from the heuristics set.

The prompt page Figure 7.4 follows from this and includes the name of the prompt and details of how to apply it. The goal of the prompt page is to allow learners to consider the prompt and how it might be applied in the context of their games. The prompt includes a description and asks questions to encourage ideation and consideration of how the heuristic might be applied. This page doesn't include examples of how games have applied the

heuristic to avoid guiding the learner too directly to examples of work. Instead, it encourages the student to consider how the heuristic might be of value to them in their own work. The Examples button will lead users to the examples if they would like to see how others applied similar principles.



Figure 7.4 The prompt page shows the prompt title and description.

The examples page Figure 7.5 keeps all the heuristic details on screen but also includes three panels with example games. Each of these games applied the heuristic of *Design for Control* in different ways, and the examples are chosen to highlight the diversity of approaches. Each example includes the title of the game and an animated GIF to demonstrate the control heuristic in gameplay. They also include a brief description of how the heuristic was applied within the game and a link to the game website/store page where users can find out more.

The Game Ideation tool was used in week 1 of the Game Tools 2 module. The goal was to encourage students to consider the controls of their game as a fundamental element as they were developing the concept. The students were encouraged to initially generate concepts based on the prompt page and only move to examples once they ran out of new concepts.

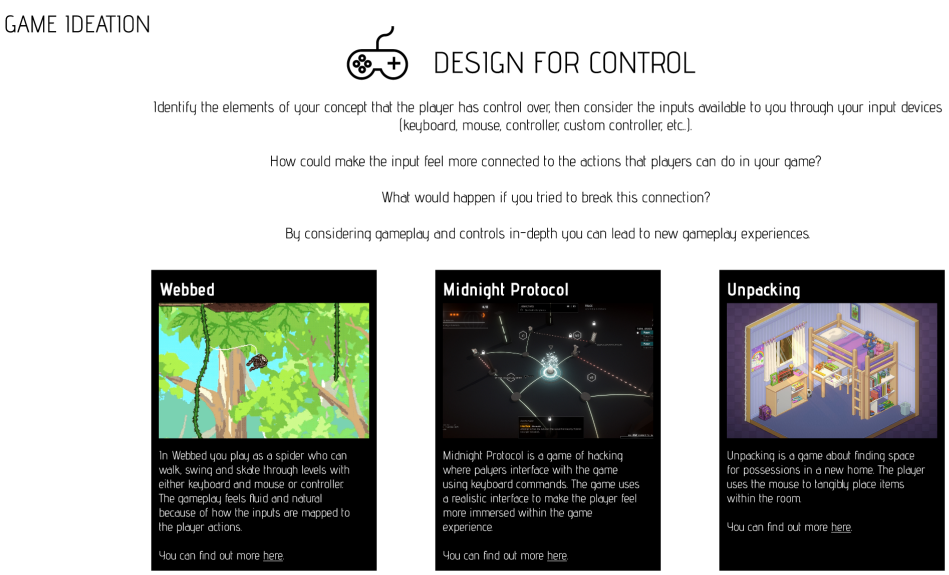


Figure 7.5 The examples page includes sample games, an animated gameplay GIF, a description and link.

They were encouraged to generate various concepts and think broadly about the prompt. Students were asked to generate ideas individually and to write them down in a notebook or file to track all their ideas regardless of perceived quality.

After students had spent 20 minutes generating design ideas based on the prompt and looking at examples, they worked as a pair to develop the ideas further. From this discussion, the pairs were encouraged to try to identify what they thought could be interesting game concepts to explore based on the idea generation session. They were also encouraged to look for concepts that might explore similar design goals or that might lead to unique gameplay. Once the pairs had decided which concepts they were taking forward individually, students were given more design time and feedback to take the concept forward into a prototype over the following week.

During class, in week two, the first 30 minutes were spent playtesting games so that each student had six people play their game and provide feedback, and they had provided feedback to six other students. During playtests, students were encouraged to take notes and debrief with the players after to gather feedback on their prototype. The students then produced a

DevLog for the week, reflecting on the development of the prototype, player feedback and learning to take forward into the remainder of the project. The following section will discuss my reflections on the effectiveness of this approach.

7.3.3 Reflection

The Game Ideation tool's goal was to support students in developing more breadth and variety of game concepts and to move away from design fixation, similar to the VNA Cards discussed in Chapter 2 (Kultima et al., 2008). Below I reflect on the Game Ideation tool as a support within the game design classroom, including the benefits, the issues and potential future directions for development.

The design heuristics encouraged some further focus on analysis-synthesis within the classroom. The structure of the session and the use of the tool encouraged students to think about their own experiences and how these might be applied to game design. In addition to this, several final submissions within the module included unique or varied control schemes. Student submissions included; a VR game, a custom controller and three other games which used player input and game feedback in non-genre typical ways. In previous years of running the module, all student teams had created genre-typical control and response systems. This suggests that while the intervention may not have had a major impact on the overall game concept, it did lead a number of teams to look beyond the expected control methods and responses. It is possible that the heuristic served to make the tacit control schemes within the projects explicit and, by focusing on this, encouraged students to expand beyond what they might typically produce. While there are some successful aspects to the intervention overall, it wasn't as effective as I had hoped. Students did focus on the control of their games, and some teams brought these concepts into development; however, many remained fixated on genre control schemes and game feedback.

While this approach has been shown to be successful in other design disciplines, it may need further iteration before being applied to game design. While game design is a creative discipline, much of the designer's practice takes place within the cycles of implementation and iteration. Consequently, early ideation in game design tends to be high-level and often focused on themes or specific mechanics that the designer would like to implement. In a field such as product design, the designer has a concrete problem and will generate a number of potential solutions to solve this problem using sketches or sketch models. In game design, the initial concepts are often text descriptions or thumbnail sketches showing how a specific mechanic might work. This leads to an issue in game design ideation where the lack of constraints on the possibility space of the design also limits the utility of an intervention such as the Game Ideation tool. Design heuristics, by their nature, may be better at encouraging designers to look for alternative solutions to a problem, but in the field of game design, the starting point often isn't a problem. The heuristic may be a useful design prompt but it didn't lead to the conceptual richness I had hoped for.

The intervention was low stakes for the students, the exercise took approximately 30 minutes out of a 4-hour class. While the intervention had some success, it suggests the potential for future improvement and iteration. As the COVID-19 pandemic has moved to endemic status, the potential for physical cards may be a viable option in future. The benefit of physical cards may be that moving the intervention away from the screen might help further move students from the source of their fixation on the tool and technical implementation. This would also allow the session to be delivered in a workshop space instead of a computer lab, which may improve collaboration at the later stages. The digital tool could then serve as an additional resource with more information on the heuristics and their applications within the game design process. The online element could include more rich data and possibly be used to build up a repository of game design heuristics.

While this points to the potential utility of heuristics as an intervention in game design learning, it also didn't quite achieve what it was hoped. The initial goal of the support was to move students beyond fixation on specific concepts and to instead generate a greater diversity of concepts. Unfortunately, while the controls and feedback were at times different, the games often still fixated on genre expectations or early concepts. The application of design heuristics in the game design classroom did not appear to generate a high degree of novel game design concepts. Rather it led to a variety of control schemes within the framework of previous fixations. While I believe this is a positive step, future work may be to consider more fundamental interventions in the game ideation process. The following section will discuss a support that explored the context of game design to provide learners with additional insight into practice.

7.4 If Found....

This support involved the use of the game *If Found...* (Dreamfeel, 2020) as part of a module, *Games in Society, Culture, and Context*, at TU Dublin. The unit came about in response to concerns raised by student body members around issues of diversity and representation in the games industry.

7.4.1 Background

In introducing this intervention, it is important to note the circumstances surrounding the context of game development and representation in late 2021. In July 2021, the State of California filed a lawsuit against the game developer and publisher Activision Blizzard (Kukumbergová, 2021). The filings claim that the culture at Activision Blizzard led to "*sex discrimination in terms and condition of employment,(including compensation, assignment, promotion, constructive discharge, termination); unlawful sexual harassment; retaliation;*

failure to prevent discrimination, harassment, and retaliation; and unequal pay" (Los Angeles County Superior Court, 2021).

At the start of our academic year in October 2021, several students wanted to meet to discuss this situation in general in the games industry, as similar occurrences had taken place at publisher-developers such as Ubisoft and Riot Games over recent years (Weststar, 2021). During this conversation, the concerned students discussed their experiences regarding elements of similar "*gamer culture*" (Paul, 2018) within the student body. Discussion at departmental and school levels took place regarding these issues and potential approaches to tackling them. However, this intervention represents a classroom-level approach to combining discussions of equality, diversity and inclusion with game design and local game production practice.

The development of this support stemmed from an observation of the classroom environment, where concerns related to student perceptions of equality, diversity, and inclusion (EDI) in the context of game design became evident. The classroom practices and dynamics revealed a need for an intervention that would support students in developing a more comprehensive understanding of the game design context. I looked at the design learning model and felt students would benefit from a support that highlighted the significance of EDI in game design, and the relevance of local production within the field.

The classroom practices highlighted certain challenges that were influencing students' perceptions and attitudes toward EDI in game design. Many students had limited exposure to diverse perspectives, leading to a narrow understanding of the diversity of voices within game development. To address these challenges, it was essential to foster a broader awareness of the game design context, emphasising the role of EDI and local production.

The support sought to explore game design within a broader context, recognising the importance of diversity in game design. To promote equality, diversity, and inclusion a case study was used as the chosen game, *If Found...*, highlighted many of these issues. It urged

students to consider potential biases and stereotypes. The case study also highlighted the importance of local cultural influences in game design. It prompted students to explore their own cultural backgrounds and those of their peers, emphasising the value of local narratives and the potential for games to reflect and celebrate local diversity. It encouraged students to draw inspiration from their own environments and experiences.

7.4.2 Implementation

When considering how I could approach the topic within the classroom, I looked to a number of sources. Of particular relevance was a talk by Bo Ruberg at the Game Developers Conference, where they discussed the challenges of "*toxic gamer culture*" within the classroom (Ruberg, 2019). I became aware through this talk and through the discussion with students that the problems diverse students faced on the programme weren't visible to me but were having an impact on student motivation, well-being, and career focus. My goal with this intervention was to introduce students to the role that issues of equality, diversity and inclusion (EDI) have within the game industry. I developed a learning unit within the *Games in Society, Culture, and Context* module that aimed to highlight EDI in the context of local game design and production.

The Games in Society, Culture, and Context Module is a semester-long module that I deliver on the BA in Game Design at TU Dublin. The module normally has approximately 35 second-year game design students who take it as a core element of their programme. The module focuses on the cultural aspects of game studies with specific attention to the practice of game design. The module is normally divided into a series of learning units, each focusing on different areas such as Games and Learning, Fan Cultures, Representation, and Video Games and Labour. In the past, I had covered a unit on games and representation, which was primarily lecture driven and specifically focused on #GamerGate (Chess & Shaw, 2015). The context described above and my conversations with educators and designers

earlier in the project and specifically the context of game development that was identified as a central theme of game design learning led me to consider a re-design of this learning unit to encourage more involvement from the students. The learning unit was re-designed to focus on a case study of the game *If Found...* (Dreamfeel, 2020), developed by the local game studio Dreamfeel.

If Found... is a visual novel set in 1993 on a remote island off the west coast of Ireland. The game follows the story of Kasio on her return home to the island and the challenges, conflict and friendship she experiences during this time. The story of the game focuses on the experiences of the trans protagonist as she navigates returning to her familial home and expressing her identity to family and friends. Players explore the pages of Kasio's diary to explore the past 28 days of her life, and through this, they build a strong connection to Kasio, her family and friends and gain a deep understanding of the challenges and triumphs she experiences during this time. The simplicity of interaction encourages players to engage with the narrative elements and form a strong connection with the protagonist and her world.

Interspersed throughout the story of Kasio is the story of a black hole about to destroy the Earth. The gameplay is simple, involving using your cursor or finger to erase the hand-drawn art to reveal the stories under each page (See Figure 7.6). The game uses subtle animations to provide movement in every scene, and brings the stylistic hand-drawn art brings the game to life. Each page that the player erases reveals further depth within the narrative, and the complexities of Kasios' life and her experiences become more apparent. The game also includes additional information for players, such as providing definitions and explanations for subjects that may be unfamiliar to an international audience. Lastly, the game highlights how local creators, artists and game makers are producing a broad range of game design work that speaks to social and cultural issues outside of the mainstream game industry.

The game was chosen as it has the potential to broaden students' understanding of games as a medium and reflect on the role of the auteur within the development of indie games.

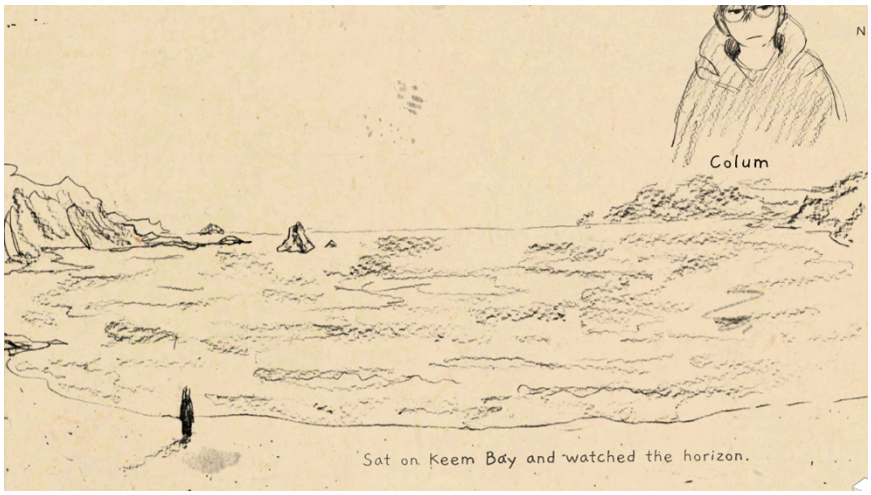


Figure 7.6 A page from Kasio's diary showing the hand-drawn art style that is used throughout the game.

The learning unit aimed to explore how games are cultural artefacts reflecting the values, beliefs, and politics of their creators. Figure 7.7 shows the overall structure of the learning unit and the activities undertaken. This structure was developed to try to ensure that students would spend time engaging with the topics of diversity and inclusion in the context of game development. The learning unit involved three different components: assigned work, a seminar, and a lecture, each of these will be discussed below.

Prior to the class, the students were assigned three different tasks so that they could have an informed opinion prior to discussing the topic in class:

1. Implicit bias evaluation
2. Gameplay experience
3. Assigned reading

For the implicit bias evaluation, I asked the students to complete the Harvard Transgender Implicit Association Test (https://implicit.harvard.edu/implicit/) to understand their own biases. Following this, the students were asked to complete the gameplay experience by playing or watching a playthrough of the game. Finally, they were assigned a reading from

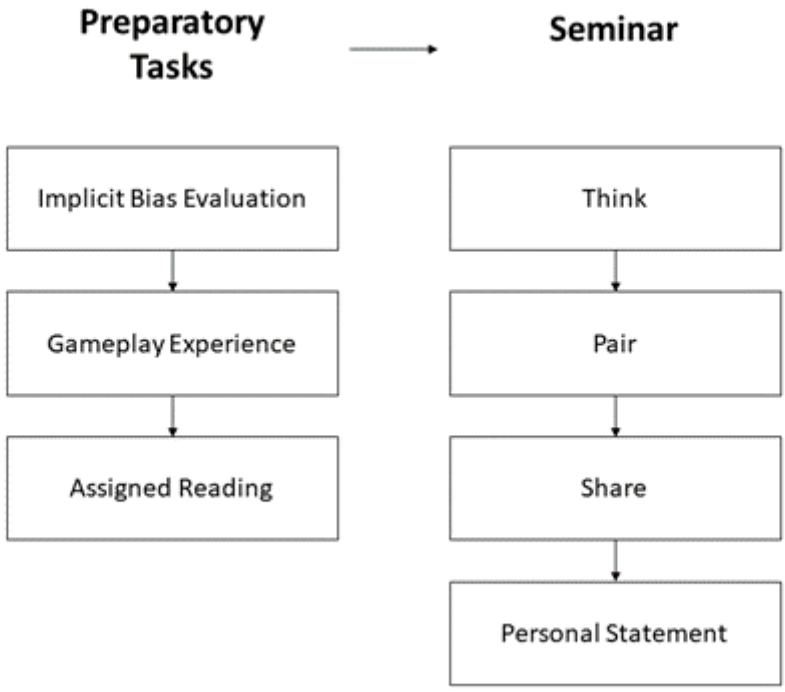


Figure 7.7 The structure of the learning unit with activities conducted at each stage.

The Queer Games Avant-Garde (Ruberg, 2020, pp. 63-72), in which the creator of If Found... , Llaura McGee, is interviewed.

The following class was structured as a seminar followed by a lecture on the topic of EDI in game development. The seminar preceded the lecture to allow students to be guided by their own experiences with the assigned work as opposed to the lecture content. The discussion was structured as a think-pair-share activity with a primary focus on the think and pair components of the method (Cooper et al., 2021). Individual students were prompted to consider the following question:

> *In what ways are the beliefs of the designer, Llaura McGee, communicated by playing If Found... ?*

After a period of time to consider the question, they were asked to pair up and structure their response to the question. They were then encouraged to share their responses with their peers, using prompts such as:

- How does Llaura's approach differ from what you see in mainstream games?
- How might diverse stories in games impact the industry as a whole?
- What can we learn about the game-making process by considering local and indie game production?
- How does diversity impact indie game design and production?

The discussion prompt questions were only used when the discussion started to slow or move off-topic to ensure that the seminar covered the expected content. Finally, students were asked to create an individual personal statement in response to the prompt:

> *As a game designer, how does my work consider the issues of diversity and local game production?*

These statements are private to the students and are not shared with the class but rather a chance to reflect on how the topics discussed can be considered in their practice. After giving time for students to consider this prompt, the class took a short break before a lecture was delivered, focusing on the topic of EDI in the context of game design and production.

7.4.3 Reflection

This learning unit was a chance for students to gain a deeper understanding of the breadth of issues at play within indie games and their impact on the game industry. The approach was a successful re-design of an existing learning unit to try to connect students with the context of game design and issues of equality, diversity and inclusion. The design did require

careful consideration of the specific details to suit the context. The following reflection may be of particular interest to academics aiming to implement similar approaches in their own teaching.

Choosing If Found... (Dreamfeel, 2020) as the subject of this intervention was a deliberate choice; I felt students might respond better to a local game with relevance to their experiences as opposed to a game from a different cultural or regional background. The game suited this purpose as it is set in Ireland and within a culture students are familiar with, as opposed to other games that might tackle similar themes from other cultural perspectives. This context was also a factor in the reading from Ruberg (2020) as Llaura discusses attending Irish game developer meetups and how at a "*games meetup I went to, it was just me, one other woman, and dozens and dozens of pasty dudes*" (p. 67). This first-hand perspective from a local designer, making games set locally, allowed the students to feel more connected to the themes of the game and their personal relevance. In my fieldnotes after the seminar, I noted:

> *I think highlighting local work is really useful and we don't do it enough. Some students were surprised to find out about the game being made in Ireland and that it had been published by Annapurna. There was a lot of discussion around attending game industry events and similar experiences that they had.*
>
> (Fieldnote, 15th February 2023)

The surprise students felt at seeing an Irish game being funded by a prestigious publisher such as Annapurna Interactive, being nominated at the Game Awards and being written about in a game studies book led to a lot of conversation among the class. Being able to relate to the experiences of the designer and protagonist of the game created a connection between aspiring designers and their communities. When discussing similar experiences at the Irish game developer meetups, it was interesting that the conversation was led by students who are in the majority but still recognised this dynamic. This also opened the door for less vocal students to contribute and speak about similar experiences. My hope is that this created a

sense of empathy and openness to the topics discussed within the learning unit that allows them to connect with the local context of game development.

The critical game design approach (Malazita & O'Donnell, 2023) was a key element of this intervention. The critical game design approach aims to "*work toward the deep synthesis of game design, cultural critique, and reflective design research practices*" (p. 6). In this intervention, I aimed to achieve this by focusing on game design and local production in the context of EDI and by encouraging reflection and connection between the topic and the student's own design work. The fact that the designer, Laura McGee, had been interviewed in The *Queer Games Avant-Garde* (Ruberg, 2020) presented an ideal opportunity to connect theory and practice and to build critical game design awareness.

If Found... is also a game that gradually builds empathy and understanding of the protagonist's perspective. I hoped that this might raise awareness of the value of diversity and inclusion in the everyday lives of our students as both players and creators. The timing of the intervention was based on student-led engagement, and as outlined in the overview of this intervention above it was a response to systemic issues within the game industry. While conversations about addressing these issues took place at the school level, this intervention sought to engage students with the topic directly and in conversation with their own design practice.

While it was overall a positive experience, the approach has its limitations. Given the cost of the game and the simplicity of interaction, students are asked to either play the game or watch a Let's Play of the game from start to end to experience the entire narrative arc of the game. A more significant issue is that supporting discussion on the topics of representation can be challenging, especially with some students, so it may be best to let students voluntarily share their thoughts as opposed to calling on students to share. As I had previously taught the students in practice-focused modules, there is also a rapport that existed in the classroom that may not be present in a purely theoretical module or where students are less familiar

with their lecturers. The following section describes a larger intervention covering a module redesign to focus on the development of design expertise within the game design classroom.

7.5 Game Tools 2

The final support describes a module redesign to focus more explicitly on the development of student design expertise over game engine features. In the past, student feedback and outcomes in the module often reflected a focus on discrete aspects of the game engine over the game design process itself. This intervention sought to align the module closer to the core game design philosophy of the programme while encouraging student development of design and development expertise. The outcomes from the module changes led to a higher standard of work and an increased focus on game design in student feedback. The following sub-sections will provide the background to the intervention, details of how it was carried out and finally, a reflection on the implementation.

7.5.1 Background

The *Game Tools 2* module is a second-year module on the BA (Hons) in Game Design at TU Dublin. The module typically has a cohort of approximately 35 students, all of whom are on the BA (Hons) in Game Design and builds on the student's knowledge from the Game Tools 1 module in the first year. Further details of the Game Tools 1 module are included in the previous chapter, as it was the site of the student learning phase of the fieldwork. The game tools modules aim to develop game development skills within the context of the four-year degree programme.

Game Tools 2 in particular, aims to equip students with intermediate game development skills with a game engine. The game tools modules within the programme were intended to develop students' design practice by using tools instead of focusing on game engine features.

However, while generally positive, the module evaluations in previous years often focused on technical details and engine features over the development of design expertise. Following the module evaluations in 2021, a proposal to modify the module to address this issue was presented to the programme committee. Following approval, a number of changes were submitted to the *Faculty Academic Quality and Enhancement Committee*. The following section will describe the changes and discuss how the module was delivered following these.

The development of a module redesign stemmed from an observation of the classroom environment. It became apparent that students were disproportionately drawn to the technical aspects of game development, often prioritising them over the critical aspects of the designerly process in game design. This intervention was conceived to shift the focus from technical proficiency to a holistic understanding of the game design process.

The classroom observations revealed certain challenges that had a direct impact on student engagement in game design. Students exhibited a strong inclination towards the technical tools and software used in game development. While technical proficiency is important, the emphasis on tools led to a neglect of the broader designerly process.

The module redesign was developed as a support to promote a more comprehensive and balanced approach to game design education. It involved a thorough rewriting of the module and its learning outcomes to reflect the overarching importance of the designerly process. The first step of the intervention involved a critical examination and rewriting of the module's learning outcomes. The revised outcomes emphasised the elements of the design learning model.

The module redesign also involved reevaluating and balancing the course content. While technical aspects were retained, they were integrated into the broader context of the designerly process. Students were guided through a process that emphasised theory, conceptualisation, problem-solving, and evaluation alongside technical proficiency.

This approach underscores the significance of a holistic understanding of game design, where technical proficiency is just one facet of a more comprehensive skill set. By nurturing students' conceptualisation, problem-solving, iteration, and evaluation skills, the module redesign aimed to equip them for the complex field of game design.

7.5.2 Implementation

The redesign for this module involved a refocusing of the module learning outcomes in the context of developing design expertise. The game design learning model served as the basis for this module redesign. The model presents designerly activity as an iterative process with analysis, synthesis and evaluation as the core elements of the design process. The module weighting and contact hours were also increased in recognition of the additional workload for the module design, as outlined below (See Table 7.2). These changes aimed to shift the focus from the game engine to the design process and engage students in authentic cycles of implementation and iteration.

The students were tasked to work on a single game project as a pair over the course of the semester. Pairs were chosen to ensure all students got significant first-hand experience of the development process and significant impact on the design outcomes while also being able to share the development with a peer. The first task the pairs were set was to decide on the broad genre and type of game they'd like to make. They were then asked to develop 3-5 design goals for the project that they would aim to achieve over the semester. The 15 weeks of the semester were split into three phases: *Design Experiments*, *Concept Development*, and *Refinement*. These titles were chosen to ensure students were aware that they were to focus on the design process as opposed to fixating on a final outcome. The entire module can be viewed as structured within the preproduction phase of the game development process. The goal is to ensure the module's outcome is a game with the potential to develop further and

Table 7.2 Overview of Game Tools 2 before and after the module revision.

	Previous	Revised
ECTS	5	10
Contact Hours	39	52
Independent Hours	61	148
Learning Outcomes	1. Apply game design techniques within a 2D/3D game engine. 2. Iterate through game concepts based on player feedback. 3. Demonstrate advanced knowledge of game engine functions such as physics, animation and networking systems. 4. Design and test player experience goals within a game engine. 5. Work effectively with media content to create digital games to a consistent and professional standard.	1. Analyse game design problems from a variety of perspectives to generate novel solutions. 2. Utilse knowledge of various game engine components and systems to develop game designs. 3. Synthesise experience with game tools and game design to create video games. 4. Develop prototypes to a high level of functionality. 5. Evaluate prototype games based on both subjective and objective factors. 6. Create prioritised plans for future work. 7. Iterate on game designs based on designer intent and player feedback. 8. Reflect on the game development process.

where game design expertise is most on display. The following sub-sections will discuss each of these phases and describe the activities students carried out in each.

Design Experiments

The first three weeks of the module focused on design experiments where students were given a weekly theme: *Control*, *Corrupted Vision*, and *Nature*. Each individual within the pair developed one prototype per week that explored that theme in the context of their design goals. The control prompt encouraged students to look at controls that felt natural within a game (the "game feel") and the unique or different types of controls that might be used in more experimental games. More detail about this prompt is provided in the *Game Ideation* section of this chapter. The corrupted vision prompt asked the students to develop a prototype from what they considered an incorrect approach. The goal was to encourage students to try things they wouldn't normally do and get a new perspective on their projects. Finally, the nature prompt asked students to consider how the natural world interacted with their design goals, what was natural, what was unnatural, and how they relate. The goal of this prototype was to encourage students to think about connecting their game with the natural world in ways they might not have considered.

Concept Development

After the *Design Experiments* phase students moved to the *Concept Development* phase working as a pair collaboratively to develop a playable prototype for the following three weeks incorporating the learning from the previous weeks. This was the first time on the project that both students had a chance to work together on a single game. By this stage of the module, the students were eager to work together and start bringing their vision for the game to life.

Refinement

The final six weeks of the project, *Refinement* focused on the development of a "*vertical slice*". This phase incorporated two external playtest sessions, one arranged with first-year students and the second student organised. In this phase, the focus of students shifted from more open-ended design into cycles of implementation and iteration. The pace of submissions and changes to the game design started to slow as the students felt they had answered many of their design questions and needed to execute a vision. Finally, students had a 2-week submission period to polish the submission and address any major issues identified.

In addition to the above elements of the module, students maintained weekly development logs where they reflected on their processes and learnings over the course of the week. Weekly lectures focused on relevant topics to their stages of production and the design model was discussed regularly to help students identify the shift in design activity throughout the stages of the project.

7.5.3 Reflection

The goal of the module redesign discussed above was to move the student focus from technical issues to design issues. The approach was overall successful and led to students developing more creatively engaging games and a deeper understanding of the design process than in previous years. Additionally, students got to experience more depth within the game engine (Unity) and underwent the process of designing refined gameplay and the challenges involved. Fieldnotes inform my reflections on the process of redesigning the module below and provide an account of the successful aspects and opportunities for future improvements. The fieldnote below reflects on the experience of discussing the model early in the module.

> *Using the design model in the classroom environment provided additional guidance for the students, and they responded well to the model and the exercise of explaining it in general. This exercise also gave me confidence in the model*

> *itself as I saw its potential as a tool to make explicit the design process. Students were able to identify aspects of the process they were comfortable with. It also gave them confidence that the process, despite its complexity, remains somewhat uniform regardless of project phase or type. I think there is a possibility that this helped them understand the unifying principles of the design process.*
>
> (Fieldnote, 10th October 2022)

Structuring the learning outcomes around the design model and referring to it regularly helped shift the module's focus from the technical to the desingerly. The model was often helpful in considering how we move from a prototyping mindset to a preproduction mindset and how this represents moving from finding out what the game is and learning how to make the game (Lemarchand, 2021). The phases of the project often represented a change in the mode of design and the types of design decisions being made. However, by highlighting the model of design and the activities designers undertake, the fundamental methods students employed were the same as during the earlier phase. They are always between initiation and outcome, they move through the design space by analysing, synthesising and evaluating, and finally, this is done within a specific context.

To develop their ability with game design analysis, students were encouraged to consider expanding their design repertoire. Specifically, this might involve playing more games, books, and movies, experiencing new things in life or even a hobby such as photography, music or art. For synthesis, the students were encouraged to deliberately think about the issues they encounter as they make games and try to generate a range of ideas. Developing evaluation skills often involved being focused playtesting, presentations, and design documentation to evaluate their game designs.

These activities can happen out of order and at different times, but they usually exist between some form of design initiation and a design outcome. In other words, design occurs when something suggests to the students that they will need to design, and that ends when they decide that the design situation no longer requires modification. The overall approach

within this process is to move from things needing design attention to a point where the design is at, or approaching, completion or at least acceptance.

The design process also took place within a context; these factors affect the design process but exist outside of it. This included experience with game tools, educational background, how well a team works together, knowing each other, and having shared interests. The context impacted design projects as it affects the possibility space of their designs; for example, a student who has never done 3D modelling can have a different expectation of what is possible when creating a first-person game than one who has created 3D models as a hobby.

The model helped to simplify the complexity of the design process that students often face when designing games. The model makes explicit the tacit elements of the game design process. It also helped students identify their strengths, weaknesses, and constraints. While critics of design models might suggest that this leads to formulaic approaches, I saw the opposite. The model was not used as a prescription for design, instead, it was used to describe the design process and served to simplify the process and aid understanding.

Despite the success of the module redesign, there are still areas that could be refined in future. The first six weeks were focused on a rapid development process that led to lots of enthusiasm and games visibly evolving every week. However, in the second phase, as students moved to produce a vertical slice over six weeks, the rapid iteration appeared to slow as students dealt with issues of production and scoping. While this is valuable in terms of experiencing an authentic development process in future, it may be worth looking to additional supports or workshops to support students during this phase. Another issue was that for a small number of teams, there were issues with the group dynamic that only became apparent at the end of the project; in future iterations, additional peer feedback may be beneficial. The following section discusses the findings from this stage of the research.

7.6 Conclusion

The objective of this study was to answer the research question:

> *RQ 4: How might a model of game design learning aid in the development of classroom supports for the acquisition of game design expertise?*

This chapter has presented a model of game design learning and a series of learning supports that were informed by the research conducted in the project. The model of game design learning led to the following research contribution:

> *RC 1: A model of game design learning.*

The model focuses on the core designerly activities of analysis, synthesis and evaluation in an iterative cycle between initiation and outcome within a design context. The model extends the Lawson (2010) model of design to develop a fundamental understanding of game design learning. It seeks to promote a shared understanding of game design education among researchers, educators, and designers. The model is also applied within the research to the development of game design learning supports to highlight the potential value of the approach. The model served as the basis for each of the supports developed within this chapter. The game design learning supports developed in this study led to the following research contribution:

> *RC 3: Higher education classroom supports for game design learning.*

The *Game Ideation* tool was a targeted support that aimed to encourage students to move beyond design fixation and to focus on analysis, synthesis and evaluation within a constrained design space. While the intervention did aid in some further creative exploration, it did not fundamentally challenge student fixation on design concepts. It did, however, encourage students to explore specific aspects of their games in-depth and led to lasting design changes for many groups.

The use of *If Found...* within the classroom as an EDI intervention looked at the context of the game design process and the challenges that designers can face. Many of my students are primarily familiar with AAA games and studios but not as familiar with indie developers. Highlighting the work of local developers and the challenges those outside of mainstream games can face helped to bring an awareness of the diversity of voices present within game design.

The *Game Tools 2* module redesign utilised the game design learning model to situate designerly activity at the centre of the student experience over the course of a 15-week module. By immersing students in a design-centric approach, they became confident in their ability to implement and iterate in an effective manner. In addition to this, supporting the module with a design model helped to demystify the design process and focus student designers on the key designerly activities of analysis, synthesis and evaluation.

The supports all differed in scale from a short in-class exercise to support ideation to a week-long learning unit and, finally, a semester-long module redesign. These interventions were selected to highlight the scales at which game design learning can be supported and the potential for them to enhance the student experience. While none of the supports can be viewed as wholly successful, they all managed to have a positive impact on the student experience and the outcomes observed within the classroom. The impact of the interventions also appeared to correspond to the timescale, where the semester-long intervention had a stronger impact on design outcomes than the ideation session with the *Game Ideation* tool.

These supports highlight the potential for design interventions informed by the literature and research conducted as part of this PhD to inform teaching practice. Specifically, the interventions highlight the value of applying a model of game design learning within the classroom. Each of the supports discussed in this chapter had positive impacts on my teaching practice and highlighted the value of research applied to classroom practice. The supports were the final fieldwork completed on the PhD. The following chapter will provide

an overview of the research, reflect on the outcomes and discuss opportunities for future work.

Chapter 8

Conclusion

In this chapter, I present the main findings and contributions of this research into game design learning. The chapter will begin with an overview of the research conducted and the findings across each stage of the work. It will then discuss how these findings relate to the broader context of game design education and add to existing discussions on the topic. I also reflect on the limitations of the research, the problems that arose during the project, and the implications for future research and practice in this field. Finally, I provide a personal account of my own learning journey as a researcher and a game design educator, highlighting the challenges and opportunities I encountered along the way and discussing the impact this journey has had on my own practice.

8.1 Overview of the Research

This section will provide a brief overview of the research presented in the previous chapters.

Chapter 2 provided a review of the literature related to game design learning. The chapter reviewed the literature from three perspectives: game design process, game design education and game design research. The review of the literature led to the development of the research questions which were investigated within the following chapters.

Chapter 3 presented the qualitative methodology which was employed in this project and discussed numerous factors relating to the chosen approach. In particular, it outlined the constructivist paradigm and the role of the DRM Methodology in terms of structuring the research project and the phases of inquiry. The chapter also outlined considerations around data collection, storage and analysis. The research approach led to the generation of rich data and unique insights into game design learning.

Chapter 4 explored the practice of game design through interviews with practising game designers to gain insights into the process. This phase of the research sought to generate empirical data on the nature of design activity and to ensure it was grounded in the experiences of those who practice it. The theoretical framework that emerged from the thematic analysis and the findings discussed in that chapter highlight the key designerly activities involved in game design. This study led to the next phase of fieldwork to understand how educators structure the game design learning process within higher education.

Chapter 5 looked at how game design educators structure game design learning within the context of higher education, with specific reference to the Irish and UK context. The goal of this phase was to generate an in-depth understanding of how educators approach teaching game design and what aspects of the process they emphasise within their classrooms. A theoretical framework of the process was developed that provided insight into how educators view their role within the learning process. The chapter specifically highlights the educators' role in constraining and structuring the game design process in a way that differs from professional practice. The artificial nature of the academic project was also highlighted through the focus on the development of student expertise and the emphasis on process over product. Finally, the chapter situates the game development project as the signature pedagogy of game design learning.

Chapter 6 provided an account of an observational study within the signature pedagogy of game design learning, the game development project, at TU Dublin. This phase of

the research sought to observe the student learning process and generate an understanding of how students move through the design process. Following data analysis, a framework of the process was developed that provided unique insights into the complexity of game design learning. The research highlights different design approaches that student designers employ in the development of game projects. In addition to this, it highlights the context and complexity of game design learning and identified how students move between design initiations and design outcomes within the process. The research presented in Chapters 4-6 provides an understanding of the game design process and its application within higher education.

Chapter 7 presents a model of game design learning that is extended from fundamental models of the design process. The model aims to support reflective practice within higher education game design programmes and to facilitate discussion of designerly activity within the field of game design. It then proposed a series of design supports developed during the research project that aimed to improve the game design learning experience within my own classroom. The supports discussed in Chapter 7 are examples of ways that educators can intervene in the game design classroom and suggest approaches to game design education.

The following section will discuss the findings in detail.

8.2 Contributions of the Research

This thesis makes a number of contributions to knowledge that will be discussed in this section. The research objective for this project was:

> *To develop an understanding of game design learning in order to support students in the acquisition of game design expertise.*

The exploration of game design learning carried out in this research has contributed to the development of teaching approaches in game design learning. These chapters first developed

an understanding of game design learning before discussing a number of supports to assist students within the game design classroom. The research presented in this project provides valuable insights into the complex and context-dependent nature of game design learning. Table 8.1 below highlights the contributions of the research based on the research questions. The following section will provide a brief summary of each research contribution.

Table 8.1 Relationship between research questions and contributions.

	RC 1: A model of game design learning.	RC 2: An account and interpretation of game design learning in higher education.	RC 3: Higher education classroom supports for game design learning.	RC 4: Proposing the game development project as the signature pedagogy of game design learning.	RC 5: An understanding of game design in relation to other design disciplines.
RQ 1: How do practising game designers describe the nature of their design process?					x
RQ 2: How do educators structure game design learning in higher education?		x		x	
RQ 3: In what ways do students apply game design approaches within game development projects?		x			
RQ 4: How might a model of game design learning aid in the development of classroom supports for the acquisition of game design expertise?	x		x		

RC 1: A model of game design learning.

A model of game design learning was developed that extended fundamental models of design to develop an understanding of game design education (Figure 8.1). The model maintains the analysis, synthesis and evaluation activities at the core of fundamental models of design (Jones, 1963; Lawson, 2010). It extends these models by highlighting the nature of initiation and outcome in game design learning as opposed to problem-solution framing. Finally, the model considers the design context as the factors outside the specific design situation that have an impact on the approaches employed.

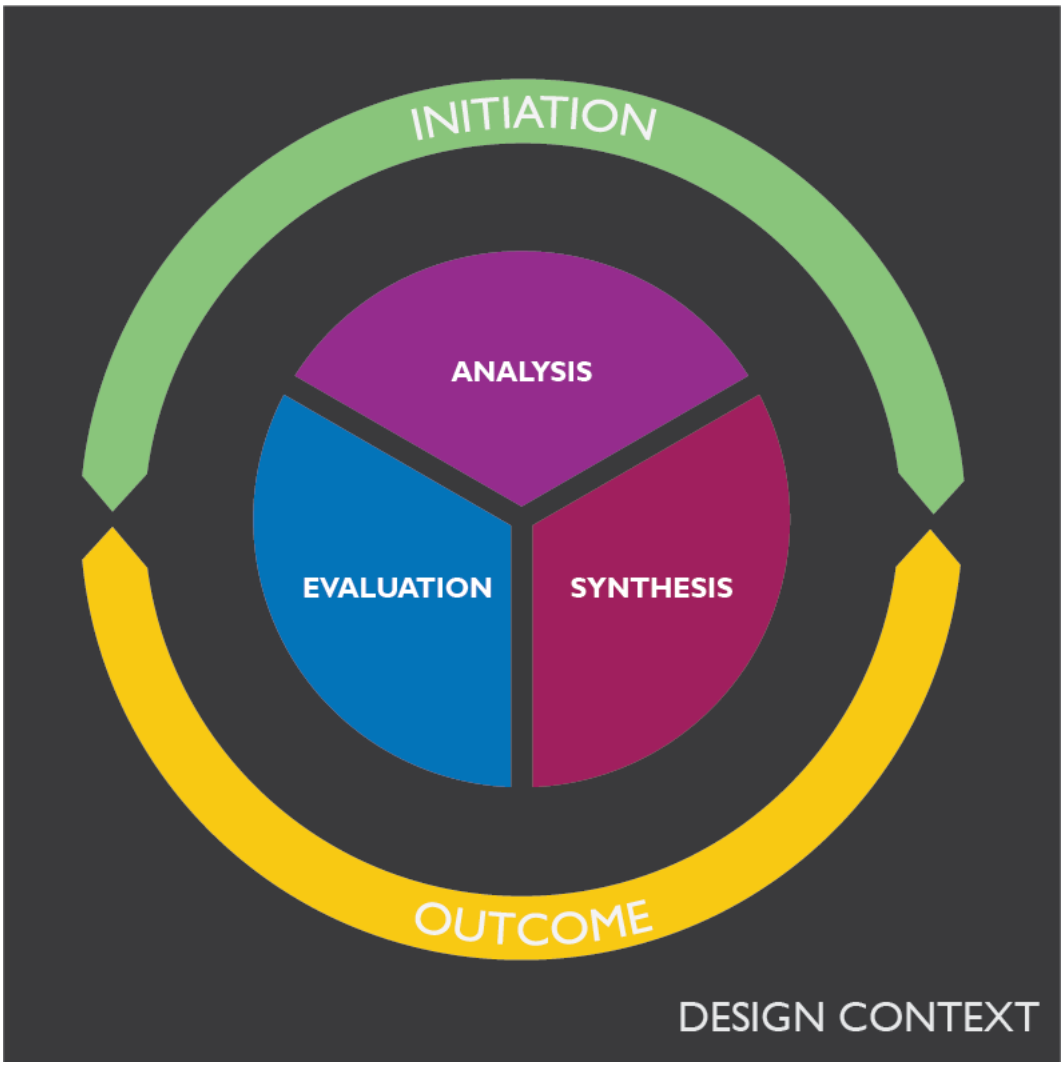


Figure 8.1 The Game Design Learning Model as presented in Chapter 7.

Analysis, synthesis and evaluation are the core activities of game design learning. Drawing on the design model from Jones (1963) these activities were reflected as the core processes of game designerly activity. From the interviews, many designers described significant elements of analysis in their work including reading books, watching documentaries, exploring nature and numerous other activities that they do when facing a design problem. Designers also described a multitude of ways to synthesise their designs, from sketches, written descriptions and discussion to flesh out ideas. The designers used evaluation regularly to identify potential issues and to improve design outcomes. Similarly, game design educators described a variety of activities aimed to support the core designerly activities. Through classroom observations, students applied research, ideation and playtesting regularly throughout the development cycle.

Game design learning takes place between design initiation and outcome. In this study movement between initiation and outcome was seen as a relationship between implementation and iteration. Implementation is required to identify whether features function as expected and how players engage with them. Iteration allows features to be refined and new insights about the nature of the design to emerge. This cycle exists between design initiation and outcome but doesn't always follow a linear progression. At times outcomes might immediately become apparent as a result of a different design decision, initiation may happen deliberately, or new insights into the game might be uncovered during development.

The final aspect of the model is the context of game design learning. Within the game development process, the importance of communication and collaboration was highlighted by all participants. Designers work with others directly or collaborate with others for feedback which in turn has an impact on the design approaches they employ and the overall process itself. Communication is widely recognised as an important skill in game design, and this research provides further evidence of that. The context of the game design process may also

include factors such as studio culture and experience with previous games or genres that all impact how the design process unfolds. Within the context of game design learning, the nature of academia and academic structures can impact how students develop game design expertise.

RC 2: An account and interpretation of game design learning in higher education.

Student game design approaches often focus on open-ended, player experience, world and technical design. While practising game designers apply solution-focused exploratory, pragmatic, and lens-focused design. Each of these approaches represents different ways of looking at the design challenges they encounter and moving the design forward. This difference between practitioners and students may be due to the nature of student game development projects, where practical concerns will take priority over conceptual factors.

Due to a lack of experience, students often seem to gravitate towards designing based on what they've seen or played before, while practising designers can consider the game from a more distant perspective. This is possible because they either work with larger, more experienced teams or are themselves more experienced. A challenge for game design education is to develop approaches that allow students to focus on the concerns of practising game designers as opposed to worrying about how they will implement features themselves. Educators must consider their role in supporting students' acquisition of these skills. We must also look at developing pedagogies that achieve more robust game design learning at the core of designerly activity.

RC 3: Higher education classroom supports for game design learning.

This research has proposed and reflected on three game design learning supports. Each intervention was found to have a positive impact on the student experience and design outcomes. This research demonstrates the application of the game design learning model

to develop supports within the classroom and the potential for research to inform teaching practice.

Game design does not follow a linear development process, and predicting and scheduling the production can be difficult due to the technical and creative factors at play. Within an academic context, students experience implementation and iteration, but it is often on a far shorter timeframe than designers experience in practice. Even degree projects (Zagal & Sharp, 2011) often offer only partial time spent across two semesters. In the context of game development practices, this represents a short development cycle and challenges students' ability to focus on big-picture concerns when the practical challenges are so great and immediate. This challenges game design educators to consider this process and how to create space for creativity and deep engagement with the cycles of implementation and iteration that practising designers encounter. Game design educators must consider the context within which their programmes are taking place and their relationship with an industry that doesn't always model the best practice. Game design educators must address the realities of crunch, diversity and burnout to effectively prepare students who wish to enter the industry.

RC 4: Proposing the game development project as the signature pedagogy of game design learning.

This research focuses on the concept of game design learning and situates the game development project as the signature pedagogy (Shulman, 2005) of game education at third level. The game development project is a common feature across programmes in game design (Czauderna, 2018) and all educators I spoke to employ game projects across their programmes. Investigating the game development project made visible the focus on technical challenges that might appear outside the remit of pure design. From interviews with practitioners, the role of a game designer often involves interfacing with technical and artistic disciplines and is not limited to a pure design space. The findings of this research

focus on game design taking place within the development of games as opposed to pure or abstract design processes.

Academia has the potential to shape future generations of game designers as the discipline becomes professionalised. Developing design expertise, engaging in authentic design processes and fostering a critical understanding of the context of game design are key skills for future game designers who, in generations to come, will shape the industry. As Shulman writes, "*signature pedagogies prefigure the cultures of professional work and provide the early socialization into the practices and values of a field. Whether in a lecture hall or a lab, in a design studio or a clinical setting, the way we teach will shape how professionals behave*" (2005, p. 59). Within game design learning, we have the opportunity to ensure that our approaches not only focus on technical expertise but also develop critical and creative game designers who will shape and impact culture.

RC 5: An understanding of game design in relation to other design disciplines.

The findings of this research suggest that game design shares many similarities in practice with other design disciplines. However, it has its own complexities in terms of the approaches taken by designers during the development process. The game design process can be adapted to different needs, depending on the team composition and the expertise of the designer. Moreover, this research highlights the unique aspects of game design, most notably the emphasis on high-fidelity implementation, as well as the importance of communication and collaboration in the design process. This study provides a window into the practice of game design, as experienced by the designers themselves.

The following section will discuss a number of limitations in relation to the research findings.

8.3 Limitations of the Research

This section will discuss a number of limitations in the research findings. Qualitative research is a valuable approach to exploring human phenomena, meanings, experiences, and perspectives. However, one of the limitations of qualitative research is that it may not provide strong evidence to support causal claims or generalisations. While I have endeavoured to be transparent and reflective in this thesis, the nature of qualitative data is often based on subjective interpretations and may not be verifiable or replicable by others. Moreover, qualitative research may be influenced by the researcher's biases, assumptions, and expectations, which may affect the validity and reliability of the findings.

Another limiting factor is the sample size in the interview phases. A limited number of participants may affect the validity and reliability of the findings, as well as the generalisability and transferability of the results to other contexts or populations. Moreover, a limited number of participants may not capture the diversity and variation of game design and learning. As an exploratory study, the goal was to capture broad design concepts as opposed to minor differences in approaches.

Transferability and generalisability are two concepts that relate to the applicability of research findings to other contexts or populations. Generalisability is the extent to which the findings of a quantitative study can be validly extended to a larger or different group or situation. Generalisability depends on the sample's representativeness and randomness, the research design, and the statistical significance of the results. Transferability is the extent to which the findings of a qualitative study can be relevant or useful to other settings or groups. Transferability depends on the richness and detail of the data, the credibility and trustworthiness of the analysis, and the similarity or comparability of the original and target contexts. While the researcher determines generalisability, transferability is determined by the reader. Therefore, this research is designed to be transferable to the reader's context instead of universally generalisable to all game design contexts.

A limitation of the research is also the efficacy of the interventions detailed in Chapter 7. This limitation arises from the predominantly qualitative nature of the research and the reliance on reflective accounts. While qualitative methods provide personal insights into the experiential aspects of the interventions, they do not provide quantitative validation of the supports. While quantitative data may have provided a stronger basis for assessing the impact of the interventions it was not closely aligned to my theoretical perspective as a researcher.

Finally, a limitation of the research was that it focused on the game design project as the site of game design learning, other activities, such as workshops and lectures weren't investigated. The other sites of game design learning weren't investigated as they were less ubiquitous in the game design literature. Focusing on the project also allowed an understanding of "*real world*" game design learning to be developed. The game development project is also proposed as the signature pedagogy of game design learning and presents a suitable context to understand the design process. The following section will discuss a number of issues that arose during the research.

8.4 Problems Arising

A number of problems arose during the PhD research that impacted the overall project. Firstly, I took a break from early 2019 to 2021 to care for my father, who was diagnosed with a serious illness in late 2018. I chose to prioritise family as I wanted to spend as much time as possible with my father, my wife and my children during this time. When I returned to the research in 2021, I felt a renewed enthusiasm and motivation for the project that was reflected in an increased academic output since this time. I gained a new perspective and appreciation for the opportunity to pursue a PhD and contribute to the advancement of knowledge in my field. I also felt more confident and resilient in facing the challenges and uncertainties that are inherent in research. Taking a break from a PhD was not an easy choice, but it was a necessary and beneficial one for me and my research.

The COVID-19 pandemic had a significant impact on the project, as it posed several challenges and limitations for the research design and methods. One of the challenges was the difficulty of scheduling interviews online with game designers and educators, who had been working remotely and had to cope with various disruptions and demands in their work and personal lives. The interviews were an important source of data for understanding the game design process and its outcomes in different contexts. However, due to the pandemic, many potential participants were unavailable to participate in online interviews, which reduced the sample size and diversity of the study. Another challenge was the difficulty of studying the classroom game design process due to the lockdown(s) and COVID-19 measures. Due to the pandemic, TU Dublin was entirely online from March 2020 to September 2021, which made it difficult to effectively observe and document the game design process in situ. A third challenge with COVID-19 was the difficulty of developing game design learning supports due to changing public health advice. Due to the pandemic, public health advice regarding social distancing, mask-wearing, and hygiene measures frequently changed, which made it difficult to plan and implement interventions that involved classroom participation. COVID-19 had a profound impact on the project, as it disrupted and constrained the research process and outcomes in multiple ways. The following section will discuss future work and avenues to explore this topic further beyond this thesis.

8.5 Future Work

This section looks at potential directions for future work in game design learning. The work completed as part of this PhD represents early attempts to understand the game design process within higher education. As has been discussed, game design is a complex activity that is highly multidisciplinary by nature and often is a highly heterogeneous process with different studios and designers implementing different approaches to each game. While a single model of the design process could not capture the complexity of this discipline,

developing models that help us to understand the fundamental elements of game designerly thinking could have significant benefits within higher education.

Further research into this area could provide new avenues for educators to improve classroom practice and to develop more critical and conceptual designers capable of tackling the ever-changing challenges of game development. Fields such as art and design have had hundreds of years to develop and refine their signature pedagogies. Within the field of game design, we are at the early stages of codifying teaching approaches for our discipline, and this presents an opportunity to develop purposeful teaching approaches as opposed to borrowing directly from our parent disciplines. This research has presented approaches to teaching game design and has uncovered new insights by looking both within our discipline and at related fields. For future work in this area, I would specifically like to look at how we can remove some complexity from game design projects. As discussed in Chapter 6, students are faced with an extremely complex design space that requires not just design but implementation. I would like to explore practical approaches to developing design expertise beyond implementation.

The second area for future work is to look at developing the Game Ideation tool further. In Chapter 7, the tool was presented, and while it served as a useful resource, I feel it requires further refinement to be a useful tool within the game design classroom. Within other design disciplines, heuristics have been shown to tackle design fixation effectively. I hope to develop the tool further and increase the database of game design heuristics to be able to empirically evaluate the tool to identify its effectiveness for game ideation. While as a tool, it is specifically designed for the game design classroom, it could be of use for game jams or similar environments where a variety of design solutions are desired. It encourages students to consider aspects of their design from a new perspective. The tool may also benefit from more interactive/custom content showcasing examples of the heuristic in practice and possibly even interviews with designers discussing their use of the heuristic.

Future work could also explore the quantification of effect sizes in order to evaluate the impact of the interventions outlined in this thesis. This could include the development of robust measurement methodologies that prioritize both the validity and reliability of the data collected for verification purposes in order to allow for further generalisation of the data. The work of Cobb et al. (2003) discusses the approaches to conducting design experiments within educational settings. Following this approach in future research and gathering a greater breadth of longitudinal data may allow for further evaluation of the effectiveness of the classroom supports.

Finally, while conducting this research, I became aware of the need for further study on the practice of game design. Game design textbooks often reduce the game design process to a series of steps. While simplification is sometimes beneficial, it can lose the nuance and complexity that designers deal with. In my interviews with designers, many of them spoke of the cut content in their games that they had worked hard on but ultimately had to remove. At this point in the interviews, it was often clear that there was an emotional relationship between the designer and their work, and I believe moments like this are worth exploring if we are to prepare students to become game designers. Developing a deeper understanding of what it means to be a game designer and preparing students to practice their craft is at the core of game design education. The following section provides a reflective account of my research journey.

8.6 Reflective Account

This research has been transformational in terms of how I view myself and my work. Conducting a research project of this scale was a learning experience as the project morphed and changed since starting back in 2016. I started this research as an early career academic, and as I finish, I feel I am entering the middle of my career with many branches of research and teaching opportunities available in the future.

This research, and specifically the student study where I observed the challenges students face in detail, has changed my relationship with my teaching practice. In game design education, I have often relied on making games as a way for students to learn aspects of design (be it level design, systemic design, narrative design, game feel, etc.). I now realise that this often places the burden on students to implement a game and design it. In my days as a product design student, I designed numerous consumer products and made sketches, foam models, 3D renders, etc., but I never had to make them function. Fields like architecture and design have had the time to develop their own pedagogies and to learn how to structure the student design process. In my own teaching going forward, I hope to explore this and consider how I can lower the burden of implementation from students when they need to produce designerly outputs.

I have also met numerous academics at conferences through this journey and feel a sense of confidence in my ability to conduct research within the field. This has led to a shift in my own identity to a focus on my role in academia. Talking to designers and observing the student design process has also made me eager to dip my toes in game development, as this part of my practice has been on hold since starting the PhD. Overall, the research journey has had a profound professional and personal impact.

8.7 Conclusion

This research has involved an exploration of game design learning within higher education. By looking at practising designers, educators and students, a rich understanding of game design learning emerged from the research. While there was no singular view of what game design activity looks like, the research provided a variety of accounts from each of these perspectives and discussed them within the model of game design learning. Several supports were discussed and reflected upon as opportunities for educators to enhance their classroom

practice. The overall research journey served to provide new insights into the game design process and presents the game design classroom as a fruitful site for future research.

References

11 Bit Studios. (2014). *This war of mine*.

Aarseth, E. (2001). Computer game studies, year one. *Game Studies: The International Journal of Computer Game Research*, *1*(1). http://gamestudies.org/0101/editorial.html

Adams, E. (2010). *Fundamentals of game design (game design and development series)* (2nd). New Riders.

Adams, E., & Dormans, J. (2012). *Game mechanics: Advanced game design* [OCLC: ocn802250851]. New Riders.

Alexander, C., Ishikawa, S., & Silverstein, M. (1977). *A pattern language: Towns, buildings, construction*. Oxford university press.

ALLEA - All European Academies. (2017). The european code of conduct for research integrity (revised edition). Retrieved September 15, 2022, from https://www.allea.org/wp-content/uploads/2017/05/ALLEA-European-Code-of-Conduct-for-Research-Integrity-2017.pdf

Andreasen, M. M. (1994). Modelling—the language of the designer [Publisher: Taylor & Francis _eprint: https://doi.org/10.1080/09544829408907876]. *Journal of Engineering Design*, *5*(2), 103–115. https://doi.org/10.1080/09544829408907876

Archer, B. (1979). Design as a discipline [Publisher: Elsevier]. *Design studies*, *1*(1), 17–20.

Ashton, D. (2009). Thinking with games: Exploring digital gaming imaginaries and values in higher education. *Journal of Media Practice*, *10*(1), 57–68. https://doi.org/10.1386/jmpr.10.1.57_1

Atari Inc. (1972). *Pong*.

Atari Inc. (1975). *Home pong*.

Atari Inc. (1979). *Asteroids*.

Bailey, H. " (2022). *Open broadcaster software* (Version 2022). https://obsproject.com/

Barney, C. (2021). *Pattern language for game design* (1st edition). CRC Press.

Baynes, K. (2008). Design education: What's the point? *Design and Technology Education: An International Journal*, *11*(3).

Beck, K., Beedle, M., Van Bennekum, A., Cockburn, A., Cunningham, W., Fowler, M., Grenning, J., Highsmith, J., Hunt, A., Jeffries, R., et al. (2001). The agile manifesto.

Belyaev, D. A., & Belyaeva, U. P. (2019). Discourses and semantic tropes of the philosophical explication of video games. *Problemos*, *96*, 172–183. https://doi.org/10.15388/Problemos.96.14

Berg Marklund, B., Engström, H., Hellkvist, M., & Backlund, P. (2019). What empirically based research tells us about game development. *The Computer Games Journal*, *8*(3), 179–198. https://doi.org/10.1007/s40869-019-00085-1

Bergstrom, K. (2022). Ignoring the blood on the tracks: Exits and departures from game studies. *Critical Studies in Media Communication*, *39*(3), 173–180. https://doi.org/10.1080/15295036.2022.2080847

Birdwell, K. (2006). The cabal: Valve's design process for creating half-life. In *The game design reader: A rules of play anthology* (pp. 212–225).

Björk, S., & Holopainen, J. (2005). *Patterns in game design* (1st ed). Charles River Media.

Blender Online Community. (2022). *Blender*. Blender Foundation. https://www.blender.org/

Blessing, L. T., & Chakrabarti, A. (2009). *DRM, a design research methodology*. Springer London. https://doi.org/10.1007/978-1-84882-587-1

Bódi, B. (2022, December 16). *Videogames and agency* (1st ed.). Routledge. https://doi.org/10.4324/9781003298786

Bonner, A., & Tolhurst, G. (2002). Insider-outsider perspectives of participant observation [Publisher: BMJ Publishing Group LTD]. *Nurse Researcher (through 2013)*, *9*(4), 7.

Bourdieu, P. F., Bourdieu, P., & Kritzman, L. D. (1993). *The field of cultural production: Essays on art and literature*. Columbia University Press.

Brannick, T., & Coghlan, D. (2007). In defense of being "native": The case for insider academic research [Publisher: SAGE Publications Inc]. *Organizational Research Methods*, *10*(1), 59–74. https://doi.org/10.1177/1094428106289253

Bravo, Ú., & Bohemia, E. (2021). Design process models as metaphors in education context. *FormAkademisk - forskningstidsskrift for design og designdidaktikk*, *14*(4). https://doi.org/10.7577/formakademisk.4655

Brown, S. L. (2009). *Play: How it shapes the brain, opens the imagination, and invigorates the soul*. Penguin.

Brown, T. (2008). Design thinking. *Harvard Business Review*, 10.

Buchanan, R. (1992). Wicked problems in design thinking. *Design Issues*, *8*(2), 5. https://doi.org/10.2307/1511637

Cerny, M. (2002). *Method* [D.I.C.E. Summit].

Charmaz, K. (2014). *Constructing grounded theory*. Sage.

Charmaz, K. (2016). Shifting the grounds: Constructivist grounded theory methods. In *Developing grounded theory* (pp. 127–193). Routledge.

Chess, S., & Shaw, A. (2015). A conspiracy of fishes, or, how we learned to stop worrying about# GamerGate and embrace hegemonic masculinity [Publisher: Taylor & Francis]. *Journal of Broadcasting & Electronic Media*, *59*(1), 208–220.

Chiapello, L. (2014). Formalizing casual games: A study based on game designers' professional knowledge. *DiGRA '13 - Proceedings of the 2013 DiGRA International Conference: DeFragging Game Studies*.

Christian, J., Daly, S., McKIlligan, S., Seifert, C., & Gonzalez, R. (2012). Design heuristics support two modes of idea generation: Initiating ideas and transitioning among concepts. *2012 ASEE Annual Conference & Exposition Proceedings*, 25.394.1–25.394.18. https://doi.org/10.18260/1-2--21152

Cobb, P., Confrey, J., DiSessa, A., Lehrer, R., & Schauble, L. (2003). Design experiments in educational research [Publisher: Sage Publications Sage CA: Thousand Oaks, CA]. *Educational researcher*, *32*(1), 9–13.

Cohen, L., Manion, L., & Morrison, K. (2017). *Research methods in education*. Routledge.

Cohendet, P., & Simon, L. (2007). Playing across the playground: Paradoxes of knowledge creation in the videogame firm. *Journal of Organizational Behavior*, *28*(5), 587–605. https://doi.org/10.1002/job.460

Cooper, K. M., Schinske, J. N., & Tanner, K. D. (2021). Reconsidering the share of a think–pair–share: Emerging limitations, alternatives, and opportunities for research [Publisher: Am Soc Cell Biol]. *CBE—Life Sciences Education*, *20*(1), fe1.

Coulton, P., & Hook, A. (2017). Games design research through game design practice. In *Game design research: An introduction to theory and practice* (p. 97). ETC Press.

Cox, J. (2014). What makes a blockbuster video game? an empirical analysis of US sales data: WHAT MAKES a BLOCKBUSTER VIDEO GAME? *Managerial and Decision Economics*, *35*(3), 189–198. https://doi.org/10.1002/mde.2608

Crawford, C. (1984). *The art of computer game design*. Osborne/McGraw-Hill Berkeley, CA.

Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and research design: Choosing among five approaches*. Sage publications.

Crilly, N. (2019). Creativity and fixation in the real world: A literature review of case study research. *Design Studies*, *64*, 154–168. https://doi.org/10.1016/j.destud.2019.07.002

Cross, N. (1982). Designerly ways of knowing [Publisher: Elsevier]. *Design studies*, *3*(4), 221–227.

Cross, N. (Ed.). (1984). *Developments in design methodology*. Wiley.

Cross, N. (2002). Creative cognition in design: Processes of exceptional designers. In T. Hewett & T. Kavanagh (Eds.), *Creativity and cognition* (pp. 14–19). ACM Press.

Cross, N. (2006). *Designerly ways of knowing*. Springer-Verlag London.

Cross, N. (2018). Developing design as a discipline. *Journal of Engineering Design*, *29*(12), 691–708. https://doi.org/10.1080/09544828.2018.1537481

Czauderna, A. (2018). Academic game design education: A comparative perspective. In S. Göbel, A. Garcia-Agundez, T. Tregel, M. Ma, J. Baalsrud Hauge, M. Oliveira, T. Marsh, & P. Caserman (Eds.), *Serious games* (pp. 9–12). Springer International Publishing.

Dadds, M. (2008). Empathetic validity in practitioner research. *Educational Action Research*, *16*(2), 279–290. https://doi.org/10.1080/09650790802011973

Daly, S. R., McKilligan, S., Leahy, K., & Seifert, C. M. (2019). Teaching design innovation skills: Design heuristics support creating, developing, and combining ideas. In D. Schaefer, G. Coates, & C. Eckert (Eds.), *Design education today* (pp. 37–60). Springer International Publishing. https://doi.org/10.1007/978-3-030-17134-6_3

Daly, S. R., Seifert, C. M., Yilmaz, S., & Gonzalez, R. (2016). Comparing ideation techniques for beginning designers. *Journal of Mechanical Design*, *138*(10), 101108. https://doi.org/10.1115/1.4034087

Davies, W. M. (2009). Groupwork as a form of assessment: Common problems and recommended solutions [Publisher: Springer]. *Higher education*, *58*(4), 563–584.

Davis, J. P., Steury, K., & Pagulayan, R. (2005). A survey method for assessing perceptions of a game: The consumer playtest in game design. *Game Studies*, *5*(1). http://www.gamestudies.org/0501/davis_steury_pagulayan/

Davis, M. (2017). *Teaching design: A guide to curriculum and pedagogy for college design faculty and teachers who use design in their classrooms*. Simon; Schuster.

de Smale, S., Kors, M. J. L., & Sandovar, A. M. (2019). The case of this war of mine: A production studies perspective on moral game design [Publisher: SAGE Publications]. *Games and Culture*, *14*(4), 387–409. https://doi.org/10.1177/1555412017725996

Deterding, S. (2017). The pyrrhic victory of game studies: Assessing the past, present, and future of interdisciplinary game research [Publisher: SAGE Publications]. *Games and Culture*, *12*(6), 521–543. https://doi.org/10.1177/1555412016665067

DeWinter, J. (2015). *Shigeru miyamoto: Super mario bros., donkey kong, the legend of zelda*. Bloomsbury Publishing USA.

Discord Inc. (2021). *Discord* (Version 2021). https://discord.com

Dorst, K., & Cross, N. (2001). Creativity in the design process: Co-evolution of problem–solution. *Design Studies*, *22*(5), 425–437. https://doi.org/10.1016/S0142-694X(01)00009-6

Dreamfeel. (2020). *If found...* https://store.steampowered.com/app/1041920/If_Found/

Drever, E. (1995). *Using semi-structured interviews in small-scale research. a teacher's guide*. ERIC.

Drisko, J. W., & Maschi, T. (2016). *Content analysis*. Pocket Guide to Social Work Re.

Dubberly, H. (2005). *How do you design?* https://www.dubberly.com/articles/how-do-you-design.html

Eberle, R. F. (1972). Developing imagination through scamper. [Publisher: ERIC]. *Journal of Creative Behavior*.

Eltham, B. (2013). Three arguments against 'soft innovation': Towards a richer understanding of cultural innovation. *International Journal of Cultural Policy*, *19*(5), 537–556. https://doi.org/10.1080/10286632.2012.658044

England, L. (2014). *"the door problem"* [Liz england]. https://lizengland.com/blog/2014/04/the-door-problem/

Estey, A., Long, J., Gooch, B., & Gooch, A. A. (2010). Investigating studio-based learning in a course on game design. *Proceedings of the Fifth International Conference on the Foundations of Digital Games - FDG '10*, 64–71. https://doi.org/10.1145/1822348.1822357

Ettlie, J. E., Bridges, W. P., & O'keefe, R. D. (1984). Organization strategy and structural differences for radical versus incremental innovation [Publisher: INFORMS]. *Management science*, *30*(6), 682–695.

European Game Developers Federation. (2022). *2020 european video games industry insights report*. European Game Developers Federation (EGDF) supported by Interactive Software Federation of Europe (ISFE). https://www.egdf.eu/2020-european-video-games-industry-insights-report/

Evbuomwan, N., Sivaloganathan, S., & Jebb, A. (1996). A survey of design philosophies, models, methods and systems [Publisher: Sage Publications Sage UK: London, England]. *Proceedings of the institution of mechanical engineers, part b: journal of engineering manufacture*, *210*(4), 301–320.

Fernández-Vara, C. (2019). *Introduction to game analysis*. Routledge.

Finke, R. A., Ward, T. B., & Smith, S. M. (1992). Creative cognition: Theory, research, and applications [Publisher: MIT press Cambridge, MA].

Flanagan, M., & Nissenbaum, H. (2014). *Values at play in digital games*. MIT Press.

Fu, K. K., Yang, M. C., & Wood, K. L. (2016). Design principles: Literature review, analysis, and future directions. *Journal of Mechanical Design*, *138*(10), 101103. https://doi.org/10.1115/1.4034105

Fullerton, T. (2019). *Game design workshop: A playcentric approach to creating innovative games* (4th). AK Peters/CRC Press. Retrieved June 28, 2021, from https://www.routledge.com/Game-Design-Workshop-A-Playcentric-Approach-to-Creating-Innovative-Games/Fullerton/p/book/9781138098770

Gekker, A. (2021). Against game studies. *Media and Communication*, *9*(1), 73–83. https://doi.org/10.17645/mac.v9i1.3315

Gericke, K., & Blessing, L. (2011). COMPARISONS OF DESIGN METHODOLOGIES AND PROCESS MODELS ACROSS DOMAINS: A LITERATURE REVIEW. *DS 68-1: Proceedings of the 18th International Conference on Engineering Design (ICED 11), Impacting Society through Engineering Design, Vol. 1: Design Processes,*

Lyngby/Copenhagen, Denmark, 15.-19.08.2011, 393–404. Retrieved September 22, 2022, from https://www.designsociety.org/publication/30438/COMPARISONS+OF+DESIGN+METHODOLOGIES+AND+PROCESS+MODELS+ACROSS+DOMAINS%3A+A+LITERATURE+REVIEW

Gibbs, G. (2009). The assessment of group work: Lessons from the literature [Publisher: Citeseer]. *Assessment Standards Knowledge Exchange*, 1–17.

Gill, S. L. (2020). Qualitative sampling methods. *Journal of Human Lactation*, *36*(4), 579–581. https://doi.org/10.1177/0890334420949218

Giri, N., & Stolterman, E. (2022). An exploratory study on game developer needs and game studio challenges. In G. Meiselwitz, A. Moallem, P. Zaphiris, A. Ioannou, R. A. Sottilare, J. Schwarz, & X. Fang (Eds.), *HCI international 2022 - late breaking papers. interaction in new media, learning and games* (pp. 581–591). Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-22131-6_43

Glaser, B. (1998). *Doing grounded theory: Issues and discussions*. Sociology Press. https://books.google.ie/books?id=XStmQgAACAAJ

Godin, B. (2008). *Innovation: The history of a category*. Project on the Intellectual History of Innovation.

Godin, D., Roux-Girard, G., Flayeux, J.-P., Boisvert, J.-P., & Savard, S. (2020). Game development praxiography: A methodological approach to setup a knowledge brokering pipeline between higher education institutions and the game development industry. *The Computer Games Journal*, *9*(1), 15–27. https://doi.org/10.1007/s40869-020-00092-7

Goldschmidt, G. (2016). Linkographic evidence for concurrent divergent and convergent thinking in creative design. *Creativity Research Journal*, *28*(2), 115–122. https://doi.org/10.1080/10400419.2016.1162497

Granados, C., Bernardo, M., & Pareja, M. (2017). How do creative industries innovate? a model proposal. *Creative Industries Journal*, *10*(3), 211–225. https://doi.org/10.1080/17510694.2017.1393192

Gray, D., Brown, S., & Macanufo, J. (2010). *Gamestorming: A playbook for innovators, rulebreakers, and changemakers*. " O'Reilly Media, Inc."

Gregor, S. (2006). The nature of theory in information systems [Publisher: JSTOR]. *MIS quarterly*, 611–642.

Gregor, S., & Jones, D. (2007). The anatomy of a design theory.

Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. In *Handbook of qualitative research* (p. 105). California, Sage Publications.

Guevara-Villalobos, O. (2011). Independent gamework and identity: Problems and subjective nuances. *Proceedings of DiGRA 2011 Conference: Think Design Play*.

Hagen, U. (2009). Where do game design ideas come from? innovation and recycling in games developed in sweden. *Breaking New Ground: Innovation in Games, Play, Practice and Theory. Proceedings of DiGRA 2009*, 11.

Hagen, U. (2011). Designing for player experience: How professional game developers communicate design visions. *Journal of Gaming & Virtual Worlds*, *3*(3), 259–275. https://doi.org/10.1386/jgvw.3.3.259_1

Hagen, U. (2012). *Lodestars for player experience* (Doctoral). Södertörn University.

Hammond, A. (2021). *The far shore: Indie games, superbrothers, and the making of JETT*. Coach House Books.

Harvey, A. (2019). Becoming gamesworkers: Diversity, higher education, and the future of the game industry. *Television & New Media*, *20*(8), 756–766. https://doi.org/10.1177/1527476419851080

Harvey, A. (2021). PASSION, PIPELINES, AND PRECARITY: WORKING LIVES IN GAMES FROM THE PERSPECTIVE OF HIGHER EDUCATION. *AoIR Selected Papers of Internet Research*. https://doi.org/10.5210/spir.v2021i0.11934

Hay, L., Duffy, A. H. B., McTeague, C., Pidgeon, L. M., Vuletic, T., & Grealy, M. (2017). A systematic review of protocol studies on conceptual design cognition: Design as search and exploration [Publisher: Cambridge University Press]. *Design Science*, *3*. https://doi.org/10.1017/dsj.2017.11

Healy, J. P. (2016). The components of the "crit" in art and design education [Publisher: Dublin Institute of Technology]. *Irish Journal of Academic Practice*, *5*(1). https://doi.org/10.21427/D7RB1V

Healy, J. P., & Cullen, C. (2022a). Design heuristics as a pattern approach to idea generation. In *Gameplay design patterns approaches - DiGRA22 [workshop]*.

Healy, J. P., & Cullen, C. (2022b). Towards a model of the design process for games. *DiGRA 2022 - Proceedings of the 2022 DiGRA International Conference*.

Henderson, D., Jablokow, K., Daly, S., McKilligan, S., Silk, E., & Bracken, J. (2019). Comparing the effects of design interventions on the quality of design concepts as a reflection of ideation flexibility [Publisher: American Society of Mechanical Engineers Digital Collection]. *Journal of Mechanical Design*, *141*(3).

Hesse-Biber, S. N. (2017). *The practice of qualitative research: Engaging students in the research process* (Third edition). SAGE.

Higinbotham, W. (1958). *Tennis for two*.

Ho, X. (2017). Evoking inspiration for game jam ideas. *Proceedings of the Second International Conference on Game Jams, Hackathons, and Game Creation Events*, 6–9. https://doi.org/10.1145/3055116.3055125

Ho, X., & Carter, M. (2019). Roguelike ancestry network visualisation: Insights from the roguelike community. *Proceedings of the 14th International Conference on the Foundations of Digital Games*, 1–9. https://doi.org/10.1145/3337722.3337761

Ho, X., Tomitsch, M., & Bednarz, T. (2015). Conceptualising inspiration networks in game design. *Transactions of the Digital Games Research Association*, *2*(1). https://doi.org/10.26503/todigra.v2i1.41

Hsiao, S.-W., Wang, M.-F., & Chen, C.-W. (2017). Time pressure and creativity in industrial design. *International Journal of Technology and Design Education*, *27*(2), 271–289. https://doi.org/10.1007/s10798-015-9343-y

Huizinga, J. (1938). *Homo ludens: Proeve eener bepaling van het spel-element der cultuur [homo ludens: A study of the play-element in culture]*. Tjeenk Willink.

Hurford, R., LaCombe, J., & Martin, A. (2020). The mirror's edge: Creating a dynamic games course that reflects industry practices and manages student expectations. *The Computer Games Journal*, 16.

IDEO. (2003). IDEO method cards: 51 ways to inspire design. https://www.ideo.com/post/method-cards

Ip, B. (2012). Fitting the needs of an industry: An examination of games design, development, and art courses in the UK. *ACM Transactions on Computing Education*, *12*(2), 1–35. https://doi.org/10.1145/2160547.2160549

Ivan, T. (2020, February 13). *Who is mark cerny, the man behind PS5?* [Video games chronicle]. Retrieved July 20, 2021, from https://www.videogameschronicle.com/features/who-is-mark-cerny/

Ivory, J. D. (2015). A brief history of video games. In *The video game debate* (pp. 1–21). Routledge.

Iwata, S., Hobonichi, S., & Bett, S. (2021). *Ask iwata: Words of wisdom from satoru iwata, nintendo's legendary CEO*. VIZ Media.

Jaaniste, L. (2009). Placing the creative sector within innovation: The full gamut. *Innovation*, *11*(2), 215–229. https://doi.org/10.5172/impp.11.2.215

Johansson-Sköldberg, U., Woodilla, J., & Çetinkaya, M. (2013). Design thinking: Past, present and possible futures. *Creativity and Innovation Management*, *22*(2), 121–146. https://doi.org/10.1111/caim.12023

Johnson, E., & Sullivan, A. (2018). Facilitating undergraduate experimental game design: A pilot study with celestial harmony. In D. Beck, C. Allison, L. Morgado, J. Pirker, A. Peña-Rios, T. Ogle, J. Richter, & C. Gütl (Eds.), *Immersive learning research network* (pp. 177–188). Springer International Publishing. https://doi.org/10.1007/978-3-319-93596-6_12

Jolis-Desautels, A. (2017, September). *Rational game design tutorial* (Workshop) [Fondations of Digital Games 2017] [Workshop].

Jónasdóttir, H. (2018). Soft innovation in the video game industry [Series Title: Advances in Intelligent Systems and Computing]. In Á. Rocha, H. Adeli, L. P. Reis, & S. Costanzo (Eds.), *Trends and advances in information systems and technologies* (pp. 30–41). Springer International Publishing. https://doi.org/10.1007/978-3-319-77703-0_3

Jónasdóttir, H., & Bygstad, B. (2019). "whoever is educated by anxiety is educated by possibility" a study of creativity in game development. *The Computer Games Journal*, *8*(3), 121–141. https://doi.org/10.1007/s40869-019-00082-4

Jones, J. C. (1963). A method of systematic design [tex.organization: Pergamon Press Ltd.]. *Conference on design methods*, 9–31.

Juul, J. (2016). Anti-inspiration in independent games.

Juul, J. (2019). *Handmade pixels: Independent video games and the quest for authenticity*. MIT Press.

Kasurinen, J., Mirzaeifar, S., & Nikula, U. (2013). Computer science students making games: A study on skill gaps and requirement. *Proceedings of the 13th Koli Calling International Conference on Computing Education Research - Koli Calling '13*, 33–41. https://doi.org/10.1145/2526968.2526972

Keith, C. (2020). *Agile game development: Build, play, repeat*. Addison-Wesley Professional.

Keogh, B. (2019a). Are videogames art school? considering the role of tertiary game development programs in australia. *Proceedings of DiGRAA 2019: What's Next?* 3.

Keogh, B. (2019b). From aggressively formalised to intensely in/formalised: Accounting for a wider range of videogame development practices. *Creative Industries Journal*, *12*(1), 14–33. https://doi.org/10.1080/17510694.2018.1532760

Keogh, B. (2023). *The videogame industry does not exist: Why we should think beyond commercial game production*. The MIT Press. Retrieved May 22, 2023, from https://mitpress.mit.edu/9780262545402/the-videogame-industry-does-not-exist/

Keogh, B., & Hardwick, T. (2023). Creative, technical, entrepreneurial: Formative tensions in game development higher education. *Games and Culture*, 155541202311768. https://doi.org/10.1177/15554120231176874

Kerr, A. (2006). *The business and culture of digital games: Gamework and gameplay*. Sage.

Keshwani, S., Lenau, T. A., Ahmed-Kristensen, S., & Chakrabarti, A. (2017). Comparing novelty of designs from biological-inspiration with those from brainstorming [Publisher: Taylor & Francis]. *Journal of Engineering Design*, *28*(10), 654–680.

Khaled, R. (2018). Questions over answers: Reflective game design. In *Playful disruption of digital media* (pp. 3–27). Springer.

Khaled, R., & Barr, P. (2023). Generative logics and conceptual clicks: A case study of the method for design materialization [Publisher: MIT Press One Broadway, 12th Floor, Cambridge, Massachusetts 02142, USA . . .]. *Design Issues*, *39*(1), 55–69.

Khaled, R., Lessard, J., & Barr, P. (2018). Documenting trajectories in design space: A methodology for applied game design research. *Proceedings of the 13th International Conference on the Foundations of Digital Games*, 1–10. https://doi.org/10.1145/3235765.3235767

Kramer, J., Daly, S., Yilmaz, S., & Seifert, C. (2014). A case-study analysis of design heuristics in an upper-level cross-disciplinary design course. *2014 ASEE Annual Conference & Exposition Proceedings*, 24.23.1–24.23.17. https://doi.org/10.18260/1-2--19915

Kuittinen, J., & Holopainen, J. (2009). Some notes on the nature of game design. *Proceedings of the 2009 DiGRA International Conference: Breaking New Ground: Innovation in Games, Play, Practice and Theory*, 8.

Kukumbergová, A. (2021). Two steps forward, one step back: What the recent lawsuit against activision blizzard tells us about the state of the industry [Publisher: Univerzita sv. Cyrila a Metoda v Trnave, Fakulta masmediálnej komunikácie]. *Acta Ludologica*, *4*(2), 125–128.

Kultima, A. (2010). The organic nature of game ideation: Game ideas arise from solitude and mature by bouncing. *Proceedings of the International Academic Conference on the Future of Game Design and Technology - Futureplay '10*, 33. https://doi.org/10.1145/1920778.1920784

Kultima, A. (2015). Game design research. *Proceedings of the 19th International Academic Mindtrek Conference*, 18–25. https://doi.org/10.1145/2818187.2818300

Kultima, A. (2017). The role of stimuli in game idea generation. *Proceedings of the 21st International Academic Mindtrek Conference*, 26–34. https://doi.org/10.1145/3131085.3131127

Kultima, A., Niemelä, J., Paavilainen, J., & Saarenpää, H. (2008). Designing game idea generation games, 137. https://doi.org/10.1145/1496984.1497007

Landay, J., & Myers, B. (2001). Sketching interfaces: Toward more human interface design. *Computer*, *34*(3), 56–64. https://doi.org/10.1109/2.910894

Lankoski, P., & Holopainen, J. (2017). *Game design research: An introduction to theory & practice* [OCLC: 1167540666]. Carnegie Mellon University: ETC Press. Retrieved May 5, 2021, from http://press.etc.cmu.edu/index.php/product/game-design-research/

Larsen, L. J. (2018). Juicing the game design process: Towards a content centric framework for understanding and teaching game design in higher education. *Educational Media International*, *55*(3), 231–254. https://doi.org/10.1080/09523987.2018.1512445

Laursen, L. N., & Haase, L. M. (2019). The shortcomings of design thinking when compared to designerly thinking. *The Design Journal*, *22*(6), 813–832. https://doi.org/10.1080/14606925.2019.1652531

Lawson, B. (2010). *How designers think: The design process demystified* (Reprint). Elsevier Architectural Press.

Lê, P. L., Massé, D., & Paris, T. (2013). Technological change at the heart of the creative process: *International Journal of Arts Management*, *15*(2), 16.

Lemarchand, R. (2021). *A playful production process: For game designers (and everyone)*. The MIT Press.

Librande, S. (2010). One page designs. *Presentation at the game developers conference*.

Liu, J.-W., Ho, C.-Y., Chang, J. Y., & Tsai, J. C.-A. (2019). The role of sprint planning and feedback in game development projects: Implications for game quality. *Journal of Systems and Software*, *154*, 79–91. https://doi.org/10.1016/j.jss.2019.04.057

Liu, L., Li, Y., Xiong, Y., Cao, J., & Yuan, P. (2017). An EEG study of the relationship between design problem statements and cognitive behaviors during conceptual design, 12.

Lloyd, P. (2019). You make it and you try it out: Seeds of design discipline futures. *Design Studies*, *65*, 167–181. https://doi.org/10.1016/j.destud.2019.10.008

Los Angeles County Superior Court. (2021, July 20). California department of fair employment and housing v. activision blizzard. https://www.documentcloud.org/documents/21014562-blizzard-activision-lawsuit-ca-dfeh

Maani, L. (2014, January). *Encouraging the acquisition of drawing skills in game design: A case study* (Doctoral dissertation). University of Gloucestershire. Gloucestershire.

Mack, N. (2005). Qualitative research methods: A data collector's field guide [Publisher: Family Health International].

Macklin, C., & Sharp, J. (2016). *Games, design and play: A detailed approach to iterative game design*. Addison-Wesley Professional.

Maguire, M., & Delahunt, B. (2017). Doing a thematic analysis: A practical, step-by-step guide for learning and teaching scholars. *8*(3).

Malazita, J., & O'Donnell, C. (2023). Introduction: Toward critical game design. *Design Issues*, *39*(1), 4–13. https://doi.org/10.1162/desi_e_00702

Manker, J. (2011). Game prototyping - the negotiation of an idea. *Proceedings of DiGRA 2011 Conference: Think Design Play.*

Manker, J. (2012). Designscape – a suggested game design prototyping process tool. *6*(1), 15.

Mann, S. (2016). *The research interview: Reflective practice and reflexivity in research processes*. Palgrave Macmillan. Retrieved September 14, 2022, from https://www.tandfonline.com/doi/full/10.1080/1743727X.2018.1425238

Marcotte, J., & Khaled, R. (2017). Critical practices in game design [Publisher: Pittsburg: ETC Press]. *Game Design Research: An Introduction to Theory & Practice*, 199–218.

McCrea, C. (2013). Web zero: The amateur and the indie game developer." [Publisher: Routledge New York]. *Amateur Media: Social, Cultural and Legal Perspectives*, 178–183.

McGill, M. M. (2009). Defining the expectation gap: A comparison of industry needs and existing game development curriculum. *Proceedings of the 4th International Conference on Foundations of Digital Games*, 129–136. https://doi.org/10.1145/1536513.1536542

McGill, M. M. (2010). Collaborative design of cross-disciplinary game minors based on the IGDA curriculum framework. *Proceedings of the fifteenth annual conference on Innovation and technology in computer science education*, 259–263. https://doi.org/10.1145/1822090.1822163

McGill, M. M. (2012). The curriculum planning process for undergraduate game degree programs in the united kingdom and united states. *ACM Transactions on Computing Education*, *12*(2), 1–47. https://doi.org/10.1145/2160547.2160550

McKenzie, T., Morales-Trujillo, M., Lukosch, S., & Hoermann, S. (2021). Is agile not agile enough? a study on how agile is applied and misapplied in the video game development industry. *2021 IEEE/ACM Joint 15th International Conference on Software and System Processes (ICSSP) and 16th ACM/IEEE International Conference on Global Software Engineering (ICGSE)*, 94–105. https://doi.org/10.1109/ICSSP-ICGSE52873.2021.00019

Meier, S. (2020). *Sid meier's memoir!: A life in computer games*. WW Norton & Company.

Melcer, E., Nguyen, T.-H. D., Chen, Z., Canossa, A., El-Nasr, M. S., & Isbister, K. (2015). Games research today: Analyzing the academic landscape 2000-2014, 9.

Mezirow, J. (2008). An overview on transformative learning [Publisher: Routledge]. *Lifelong learning*, 40–54.

Microsoft Corporation. (2022). *Microsoft teams* (Version 2022). https://products.office.com/teams

Mitchell, A., Greer, T., New, W., Walton-Rivers, J., Watkins, M., Brown, D., & Scott, M. J. (2021). Student perspectives on the purpose of peer evaluation during group game development projects. *United Kingdom and Ireland Computing Education Research conference.*, 1–7. https://doi.org/10.1145/3481282.3481294

Mitchell, A., Scott, M., Walton-Rivers, J., Watkins, M., New, W., & Brown, D. (2022). An exploratory analysis of student experiences with peer evaluation in group game development projects. *The United Kingdom and Ireland Computing Education Research (UKICER) Conference*, 1–7. https://doi.org/10.1145/3555009.3555021

Miyamoto, S. (1986). *The legend of zelda*.

Musante, K., & DeWalt, B. R. (2010). *Participant observation: A guide for fieldworkers*. Rowman Altamira.

Nash, P., & Shaffer, D. W. (2013). Epistemic trajectories: Mentoring in a game design practicum. *Instructional Science*, *41*(4), 745–771. https://doi.org/10.1007/s11251-012-9255-0

Neil, K. (2015). *Game design tools: Can they improve game design practice?* (Doctoral dissertation). Flinders University of South Australia.

Neroni, M. A., & Crilly, N. (2021). How to guard against fixation? demonstrating individual vulnerability is more effective than warning of general risk [Publisher: Wiley Online Library]. *The Journal of Creative Behavior*, *55*(2), 447–463.

Nolen, A. L., & Putten, J. V. (2007). Action research in education: Addressing gaps in ethical principles and practices. *Educational Researcher*, *36*(7), 401–407. https://doi.org/10.3102/0013189X07309629

Novak, J. (2022). *Game development essentials: An introduction* (4th). Novy Unlimited.

O'Donnell, C. (2014). *Developer's dilemma: The secret world of videogame creators*. MIT press.

OECD & Eurostat. (2018, October 22). *Oslo manual 2018: Guidelines for collecting, reporting and using data on innovation, 4th edition*. https://doi.org/10.1787/9789264304604-en

O'Hagan, A. O., & O'Connor, R. V. (2015). Towards an understanding of game software development processes: A case study [Series Title: Communications in Computer and Information Science]. In R. V. O'Connor, M. Umay Akkaya, K. Kemaneci, M. Yilmaz, A. Poth, & R. Messnarz (Eds.), *Systems, software and services process improvement*

(pp. 3–16). Springer International Publishing. https://doi.org/10.1007/978-3-319-24647-5_1

Ouellette, M., & Conway, S. (2021). The game studies crisis: What are the rules of play? *Eludamos: Journal for Computer Game Culture*, *11*(1), 145–159. https://doi.org/10.7557/23.6360

Paul, C. A. (2018). *The toxic meritocracy of video games: Why gaming culture is the worst*. U of Minnesota Press.

Peirce, C. S. (1974). *Collected papers of charles sanders peirce* (Vol. 5). Harvard University Press.

Phillippi, J., & Lauderdale, J. (2018). A guide to field notes for qualitative research: Context and conversation [Publisher: Sage Publications Sage CA: Los Angeles, CA]. *Qualitative health research*, *28*(3), 381–388.

Ponterotto, J. (2006). Brief note on the origins, evolution, and meaning of the qualitative research concept thick description. *The Qualitative Report*, *11*(3), 538–549. https://doi.org/10.46743/2160-3715/2006.1666

Potter, N. (2002). *What is a designer: Things, places, messages* (4th ed). Hyphen Press.

PricewaterhouseCoopers, . (2022). *Global entertainment & media outlook 2022–2026 perspectives report* [PwC]. Retrieved May 30, 2023, from https://www.pwc.com/gx/en/industries/tmt/media/outlook/outlook-perspectives.html

Ramis, H. (1993). *Groundhog day*.

Riede, F., Johannsen, N. N., Högberg, A., Nowell, A., & Lombard, M. (2018). The role of play objects and object play in human cognitive evolution and innovation. *Evolutionary Anthropology: Issues, News, and Reviews*, *27*(1), 46–59. https://doi.org/10.1002/evan.21555

Rittel, H. W. J., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy Sciences*, *4*.

Robertson, B., & Radcliffe, D. (2009). Impact of CAD tools on creative problem solving in engineering design. *Computer-Aided Design*, *41*(3), 136–146. https://doi.org/https://doi.org/10.1016/j.cad.2008.06.007

Robson, C., & McCartan, K. (2016). *Real world research*. Wiley Global Education.

Rouse, R., & Malazita, J. (2023). Critical disciplinary thinking and curricular design in games. *Design Issues*, *39*(1), 88–104. https://doi.org/10.1162/desi_a_00708

Ruberg, B. (2020). *The queer games avant-garde: How LGBTQ game makers are reimagining the medium of video games*. Duke University Press.

Ruberg, B. (2019). *What to do when "toxic gamer culture" enters the classroom*. Retrieved March 20, 2023, from https://gdcvault.com/play/1025923/What-to-Do-When-Toxic

Runco, M. A. (1988). Creativity research: Originality, utility, and integration.

Runco, M. A., & Jaeger, G. J. (2012). The standard definition of creativity [Publisher: Taylor & Francis]. *Creativity research journal*, *24*(1), 92–96.

Russell, S., Graetz, M., & Witaenem, W. (1962). *Spacewar!*

Saldaña, J. (2016). *The coding manual for qualitative researchers* (3rd) [Publisher: SAGE publications Ltd]. SAGE Publications Ltd.

Salen, K., & Zimmerman, E. (2004). *Rules of play: Game design fundamentals*. MIT press.

Sánchez, R. E., Zagalo, N., & Gómez, S. C. (2021). Creative process of pre-production of video games. In A. Brooks, E. I. Brooks, & D. Jonathan (Eds.), *Interactivity and game creation* (pp. 198–211). Springer International Publishing. https://doi.org/10.1007/978-3-030-73426-8_11

Sanders Associates. (1972). *Magnavox odyssey*.

Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research methods for business students*. Pearson education.

Schon, D. A. (1979). The reflective practitioner. *New York*.

Sellers, M. (2017). *Advanced game design: A systems approach*. Addison-Wesley Professional.

Sengers, P., Boehner, K., David, S., & Kaye, J. '. (2005). Reflective design [Number of pages: 10 Place: Aarhus, Denmark]. *Proceedings of the 4th decennial conference on critical computing: Between sense and sensibility*, 49–58. https://doi.org/10.1145/1094562.1094569

Shah, J. J., Kulkarni, S. V., & Vargas-Hernandez, N. (2000). Evaluation of idea generation methods for conceptual design: Effectiveness metrics and design of experiments. *Journal of Mechanical Design*, *122*(4), 377. https://doi.org/10.1115/1.1315592

Shapiro, A. R. (2006). Measuring innovation: Beyond revenue from new products [Publisher: Taylor & Francis]. *Research-Technology Management*, *49*(6), 42–51.

Shedworks. (2021). *Sable*.

Shulman, L. S. (2005). Signature pedagogies in the professions. *Daedalus*, *134*(3), 52–59. https://doi.org/10.1162/0011526054622015

Skype Technologies. (2019). *Skype* (Version 2019). www.skype.com

Sotamaa, O., & Svelch, J. (2021). Game production studies [OCLC: 1249666227].

Special Interest Group in Game Education, ., International Game Developers Association. (2008). IGDA curriculum framework: The study of games and game development (3.2 ed.) Retrieved April 28, 2022, from https://silo.tips/download/igda-curriculum-framework

Steel Wool Studios. (2021). *Five nights at freddy's: Security breach*.

Stoneman, P. (2011). *Soft innovation: Economics, product aesthetics, and the creative industries* (Pbk. ed). Oxford University Press.

Storz, C., Riboldazzi, F., & John, M. (2015). Mobility and innovation: A cross-country comparison in the video games industry. *Research Policy*, *44*(1), 121–137. https://doi.org/10.1016/j.respol.2014.07.015

Strauss, A., & Corbin, J. (1990). *Basics of qualitative research*. Sage publications.

Sturdee, M., & Lindley, J. (2019). Sketching & drawing as future inquiry in HCI. *Proceedings of the Halfway to the Future Symposium 2019*, 1–10. https://doi.org/10.1145/3363384.3363402

Suwa, M., Gero, J. S., & Purcell, T. A. (1998). The roles of sketches in early conceptual design processes. In *Proceedings of the twentieth annual conference of the cognitive science society* (1st ed., pp. 1043–1048). Routledge. https://doi.org/10.4324/9781315782416-188

Taylor, J. (2011). The intimate insider: Negotiating the ethics of friendship when doing insider research [Publisher: SAGE Publications]. *Qualitative Research*, *11*(1), 3–22. https://doi.org/10.1177/1468794110384447

Thompson, J. B. (1995). *The media and modernity: A social theory of the media*. Stanford University Press.

Timmermans, S., & Tavory, I. (2012). Theory construction in qualitative research: From grounded theory to abductive analysis. *Sociological Theory*, *30*(3), 167–186. https://doi.org/10.1177/0735275112457914

Tomal, D. R. (2010). *Action research for educators*. Rowman & Littlefield Publishers.

Tracy, S. J. (2010). Qualitative quality: Eight "big-tent" criteria for excellent qualitative research [Publisher: Sage Publications Sage CA: Los Angeles, CA]. *Qualitative inquiry*, *16*(10), 837–851.

Tschang, F. T., & Szczypula, J. (2006). Idea creation, constructivism and evolution as key characteristics in the videogame artifact design process. *European Management Journal*, *24*(4), 270–287. https://doi.org/10.1016/j.emj.2006.05.003

TU Dublin. (2022). Technological university dublin data protection policy. https : / / www . tudublin . ie / media / website / explore / privacy - policyx2fgdpr/documents/Data-Protection-Policy-May2022.pdf

Tunnel, R.-H., & Norbisrath, U. (2022). A survey of estonian video game industry needs. *Journal of Education and Learning*, *11*(5), 183. https://doi.org/10.5539/jel.v11n5p183

Tunnel, R.-H., & Norbisrath, U. (2023). Classification of video games bachelor's curricula. *Journal of Education and Learning*, *12*(2), 39. https://doi.org/10.5539/jel.v12n2p39

Tversky, B., Suwa, M., Agrawala, M., Heiser, J., Stolte, C., Hanrahan, P., Phan, D., Klingner, J., Daniel, M.-P., Lee, P., & Haymaker, J. (2003). Sketches for design and design of sketches. In U. Lindemann (Ed.), *Human behaviour in design* (pp. 79–86). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-662-07811-2_9

Unluer, S. (2015). Being an insider researcher while conducting case study research. *The Qualitative Report*. https://doi.org/10.46743/2160-3715/2012.1752

Victoria and Albert Museum. (2018). *Videogames: Design/play/disrupt*. https://www.vam.ac.uk/exhibitions/videogames

Visser, W. (2006). *The cognitive artifacts of designing*. CRC Press.

Vygotsky, L. S. (1978). *Mind in society: Development of higher psychological processes*. Harvard university press.

Waller, V., Farquharson, K., & Dempsey, D. (2015). *Qualitative social research: Contemporary methods for the digital age*. Sage.

Wang, A. I., & Nordmark, N. (2015). Software architectures and the creative processes in game development [Series Title: Lecture Notes in Computer Science]. In K. Chorianopoulos, M. Divitini, J. Baalsrud Hauge, L. Jaccheri, & R. Malaka (Eds.), *Entertainment computing - ICEC 2015* (pp. 272–285). Springer International Publishing. https://doi.org/10.1007/978-3-319-24589-8_21

Wang, A. I., & Wu, B. (2009). An application of a game development framework in higher education. *International Journal of Computer Games Technology*, *2009*, 1–12. https://doi.org/10.1155/2009/693267

Ward, T. B. (2007). Creative cognition as a window on creativity [Publisher: Elsevier]. *Methods-a Companion to Methods in Enzymology*, *42*(1), 28–37.

Weststar, J. (2021, September 8). *Activision blizzard's sexual harassment scandal is not a one-off for the gaming industry* [The conversation]. Retrieved March 20, 2023, from http://theconversation.com/activision-blizzards-sexual-harassment-scandal-is-not-a-one-off-for-the-gaming-industry-166729

Weststar, J., & Dubois, L.-É. (2022). From crunch to grind: Adopting servitization in project-based creative work. *Work, Employment and Society*, 095001702110612. https://doi.org/10.1177/09500170211061228

Whitson, J. R. (2020). What can we learn from studio studies ethnographies?: A "messy" account of game development materiality, learning, and expertise. *Games and Culture*, *15*(3), 266–288. https://doi.org/10.1177/1555412018783320

Wolf, M. J., & Perron, B. (2003). *The video game theory reader*. Psychology Press.

Wynn, D. C., & Clarkson, P. J. (2018). Process models in design and development [Publisher: Springer]. *Research in Engineering Design*, *29*(2), 161–202.

Yang, M. C. (2005). A study of prototypes, design activity, and design outcome. *Design Studies*, *26*(6), 649–669. https://doi.org/10.1016/j.destud.2005.04.005

Yilmaz, S., Seifert, C., & Gonzalez, R. (2010). Cognitive heuristics in design: Instructional strategies to increase creativity in idea generation. *Artificial Intelligence for Engineering Design, Analysis and Manufacturing*, *24*(3), 335–355. https://doi.org/10.1017/S0890060410000235

Yilmaz, S., & Seifert, C. M. (2011). Creativity through design heuristics: A case study of expert product design. *Design Studies*, *32*(4), 384–415. https://doi.org/10.1016/j.destud.2011.01.003

Youmans, R., & Arciszewski, T. (2014). Design fixation: Classifications and modern methods of prevention. *Artificial Intelligence for Engineering Design, Analysis and Manufacturing*, *28*, 129–137. https://doi.org/10.1017/S0890060414000043

Young, C. J. (2018). *Game changers: Everyday gamemakers and the development of the video game industry* (Doctoral dissertation). University of Toronto. Faculty of Information.

Zagal, J. P., & Sharp, J. (2011). A survey of final project courses in game programs: Considerations for teaching capstone, 14.

Zimmerman, E. (2013, September 15). *How i teach game design. prologue: The practice of game design* [Being playful]. Retrieved July 20, 2021, from https://ericzimmerman.wordpress.com/2013/09/15/how-i-teach-prologue/

Appendix A

Project Information Sheets

A.1 Interview Participant Project Information Sheet

Project Title: The problem-solving approaches of game designers

Research Investigator: John P. Healy

TU Dublin Research Ethics Reference: REC-18-147

Background

I would like to invite you to take part in a research study exploring the problem-solving approaches of game designers. Before you decide you need to understand why the research is being done and what it would involve for you. Please take time to read the following information carefully.

Ask questions if anything you read is not clear or if you would like more information. Take time to decide whether or not to take part.

About the project

My name is John P. Healy and I am conducting a research study on the problem-solving approaches of game designers. This PhD research seeks to explore how game designers tackle design problems in their work. It aims to identify approaches that professional designers use when producing games and compare this to the approaches of designers in other disciplines.

The first study will involve gathering data from game designers via semi-structured interviews. The aim of this study is to interview game designers across a variety of projects to gain a better understanding of their creative process. The results of this study will help inform practitioners, designers and students of game design in relation to problem-solving approaches within the field. This study is an element of my Ph.D. research and the results will be published in the final thesis.

What does involvement in this study mean for me?

If you agree, you will be invited to participate in an interview that will take approximately 1 hour. Details of the date, time and venue will be arranged if you wish to take part. Where in-person interviews cannot be conducted, video or audio calls may be used. The interview will involve several questions in relation to your design process and will be recorded.

The interview will then be transcribed verbatim. Transcripts will be sent to participants via email with a 2-week approval window. At this point, you may choose to redact information or clarify answers to be included in the final transcript. If you would like to suggest further participants for the study, you may do so.

Do I have to take part?

It is completely up to you to decide whether you want to take part in this study. If you do decide to take part, you will be asked to sign a consent form before the study. However, you are free to withdraw from the study at any time and without giving a reason.

Why have I been chosen to participate?

Participants have been chosen as they are practising game designers and will initially be selected from my network of contacts.

What are the possible risks and benefits of taking part?

By taking part in this study you may share data that allows you to be identified, however, every effort will be made to ensure all direct quotations used in published research do not allow the identification of individual developers or projects.

By taking part you may be able to reflect on your own design process and make explicit your intrinsic methods.

What will happen to the results of this research study?

Information from the study may be used to contribute to the PhD thesis, meetings, conference presentations and research papers. However, all data will be presented in a completely anonymised format.

Who is organising and funding this research?

This project is funded by TU Dublin. The study is being carried out by the researcher named above.

Who has reviewed the study?

This study has been reviewed and approved by the Research Ethics Committee TU Dublin, reference: REC-18-147.

Who do I complain to if I am not happy about the study?

If you are not happy about any aspect of this study, please contact Mr. John P. Healy, Researcher, in the first instance (john.p.healy@dit.ie; Tel. 01 4023269). If you are not satisfied with the response, please contact Dr. Charlie Cullen, Research Supervisor [Charlie.cullen@tudublin.ie; Tel. 01 4023038].

Who do I contact for further information about the research?

For further information, please contact Mr. John P. Healy.

Address: Room 2-004, TU Dublin Aungier Street, Dublin 2, Ireland

Phone: 01 4023269

Email: john.p.healy@tudublin.ie

Thank you for your time!

A.2 Student Participant Information Sheet

Project Title: Exploring the process of student game designers

Research Investigator: John P. Healy

TU Dublin Research Ethics Reference: REIC-21-43

Background

I would like to invite you to take part in a research study exploring the design processes used by student game designers. Before you decide you need to understand why the research is being done and what it would involve for you. Please take time to read the following information carefully.

Ask questions if anything you read is not clear or if you would like more information. Take time to consider this information before proceeding to the consent form.

About the project

My name is John P. Healy and I am conducting a research study on the design process of student game designers. My PhD research seeks to explore how game designers tackle design problems in their work. This research is being undertaken to address the current lack of research exploring the design process as it applies to game designers. The field of design cognition explores how designers approach problems when designing and researchers have studied the design cognition process in architects, industrial designers, and engineers.

This research is a follow-on study from REC-18-147 *Exploring the problem-solving approaches of game designers* that looked at the design process of professional indie game designers. In this case, the lack of existing research related to the game design processes employed by student designers provides an opportunity to explore the existing situation within the game design classroom. The expectation is to use this data gathered through observation to better understand the design process of student designers to understand if and

how the process differs from professionals. The results of this study will lead to the next phase of the research project which will develop and evaluate approaches to support game design educators.

What does involvement in this study mean for me?

Whether you choose to participate in the study or not the module will continue as normal with no additional requirement or impact on your experience. The first step is to complete the consent form provided along with this information sheet to either agree to have your data included in the study or not.

While your experience of the module will not change, I will be researching your design process during the final module project. During this project, I will be taking notes after class where I reflect on observations around the design process you have employed and after module results are ratified by the exam board I will be analysing your final design reports to gain insights into your approach.

Do I have to take part?

It is completely up to you to decide whether you want to take part in this study and will have no impact on your studies at TU Dublin. If you decide to participate but later change your mind you are free to withdraw from the study at any time and without giving a reason. Should you withdraw before the publication of any data your information will be removed from the research data.

Why have I been chosen to participate?

Participants have been chosen as they are student game designers undergoing a formal programme of academic study in the field of game design.

What are the possible benefits and risks of taking part?

The information collated in this study will help us identify the process through which students design games and develop supports for game design education. The insights from this survey can benefit yourself, your peers and other students on the programme.

Every effort will be made to protect your data and to ensure the published research does not allow the identification of individual students or projects.

What will happen to the results of this research study?

Information from the study may be used to contribute to the PhD thesis, meetings, conference presentations and research papers. However, all data will be presented in a completely anonymised format.

How will my data be stored?

- All research data will be anonymised and stored per the Data Protection Act (2018).
- All data will be encrypted and stored on a Microsoft OneDrive account. This will be backed up stored on a hard drive in the researchers' office and locked at the researchers' desk.
- No other party will have access to the research data. All devices used to record and/or handle data (TU Dublin laptops) are encrypted.
- All data will remain confidential and publication(s) resulting from this work will contain anonymised data.
- Data generated during the research will be held for 2 years after the completion of the research project as per the TU Dublin policy on Documenting Results and Storing Primary Data.

Do you have further details on the methodology used?

The study is designed to be naturalistic, using qualitative approaches to understand the context of the design processes employed by game design students. To ensure the data gathered has minimal impact on the students learning within TU Dublin and to ensure ecological validity of the study ethnographic research was chosen (Cohen, Manion & Morrison, 2009, pp. 167-190). Two methods are included in the study: **Observation** (Musante & DeWalt, 2010) within the classroom and **Themeatic Analysis** (Drisko & Mashi, 2015) of submitted work. In the course of this module, Game Tools 1, students create a game project from concept to prototype as their final assignment, the goal of this study is to observe the design process and design outcomes in a minimally impactful manner.

The observational data gathered will be in the form of field notes while this project is ongoing, completed outside of class time and as soon as the class session finishes as possible. Each field note will be assigned a unique identifier tied to that class session and will not include any information which could identify individual students. The content of the field notes will include: setting, participants, classroom interactions and critical reflection (Phillippi & Lauderdale, 2018). It is likely setting, and participants details will be largely similar for the duration of the study, however where groups cluster to work together or the room layout is adjusted this should be noted and similarly attendance rates and their impact on group dynamics may be a dynamic factor regarding participants in the field notes.

The thematic analysis will be conducted on the student submissions which include the completed game project and a reflective account where students discuss their design process (both submissions are currently published online as part of the module submission requirements). A related study using thematic analysis of design projects was conducted by Joshi et al. (2019) who analysed final design reports to identify how problem statements and requirements impacted final design report content. The thematic analysis data will be

deductively coded to the Process Model of Game Design (Healy & Cullen, 2022), developed earlier in the research project.

The thematic analysis and subsequent triangulation with the literature and fieldnotes will only take place following the Semester 2 exam board. No student data or identifying information will be included in any publications emerging from this research.

Who is organising and funding this research?

This project is funded by TU Dublin, the study is being carried out by the researcher named above.

Who has reviewed the study?

This study has been reviewed and approved by the Research Ethics and Integrity Committee TU Dublin, reference: REIC-21-43.

Who do I complain to if I am not happy about the study?

If you are not happy about any aspect of this study, please contact Mr John P. Healy, Researcher, in the first instance (john.p.healy@tudublin.ie; Tel. 01 4023269). If you are not satisfied with the response, please contact Dr Charlie Cullen, Research Supervisor [Charlie.cullen@tudublin.ie; Tel. 01 4023038].

Who do I contact for further information about the research?

For further information, please contact Mr John P. Healy.

Address: Room 2-004, TU Dublin Aungier Street, Dublin 2, Ireland

Phone: 01 4023269

Email: john.p.healy@tudublin.ie

Thank you for your time!

References

Cohen, L., Manion, L., & Morrison, K. (2002). Research methods in education (6th ed.). Routledge.

Drisko, J. W., & Maschi, T. (2016). Content analysis: Pocket Guides to Social Work Research Methods. Oxford University Press.

Healy, J. P. & Cullen, C. (2022) 'The Process Model of Game Design' in DiGRA '22 - Proceedings of the 2022 DiGRA International Conference: Bringing Worlds Together, 2022. (Forthcoming).

Joshi, S., Morkos, B., & Summers, J. D. (2019). Mapping problem and requirements to final solution: A document analysis of capstone design projects. International Journal of Mechanical Engineering Education, 47(4), 338-370.

Musante, K., & DeWalt, B. R. (2010). Participant observation: A guide for fieldworkers. Rowman Altamira.

Phillippi, J., & Lauderdale, J. (2018). A guide to field notes for qualitative research: Context and conversation. Qualitative health research, 28(3), 381-388.

Appendix B

Consent Forms

B.1 Interview Consent Form

Consent Form for Interviews

Thank you for reading the information sheet about the interview. If you are happy to participate then please complete and sign the form below. Please initial the boxes below to confirm that you agree with each statement:

	Please Initial box:
I have read and understood the information sheet and have had the opportunity to ask questions.	☐
I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and without negative consequences. Should I not wish to answer any particular question or questions, I understand that I am free to decline.	☐
I understand that my responses will be kept strictly confidential. My name will not be linked with the research materials, and will not be identified or identifiable in the publications developed as a result of the research.	☐
I agree for the audio of this interview to be recorded, archived and analysed for future research purposes.	☐
I understand that no other use will be made of the recording without my written permission, and that no one outside the research team will be allowed access to the original recording.	☐
I agree to take part in this interview.	☐

Name of participant Date Signature

_____ _____ _____

Principal Investigator Date Signature

To be counter-signed and dated electronically for telephone/online interviews or in the presence of the participant for face to face interviews

Copies: *Once this has been signed by all parties the participant should receive a copy of the signed and dated participant consent form, and the information sheet. A copy of the signed and dated consent form should be placed in the main project file which must be kept in a secure location.*

B.2 Student Consent Form

Understanding the Game Design Process

You are being invited to participate in a research project that explores the game design process and specifically the design process of student game designers. This study is being conducted by John P. Healy and Charlie Cullen from the schools of Media and Electrical and Electronic Engineering at TU Dublin.

This form seeks your consent to be a participant in the research as you are currently developing your practice as a game designer. The information collated in this study will help us identify the process through which students design games and develop supports for game design education. The insights from this research could benefit yourself, your peers and other students on the programme.

Procedures:

1. Whether you choose to participate in the study or not the module will continue as normal with no additional requirement or impact on your experience. For students who choose to participate the following steps outline how the data will be gathered (if you choose not to participate no data related to your design process will be gathered).

2. During the final module project, your lecturer (John P. Healy) will write observations from the design process employed in developing your projects. These observations will be recorded after class and will not include any identifying information.

3. 3At the end of the module,after grading and exam boards have been completed the data from those students who chose to participate will be collated and anonymised for analysis.

4. The anonymised data obtained by the analysis and the field notes are intended for use in academic publications.

You can choose whether or not to participate in this study with no impact on your studies. **You are also free to withdraw consent at any point** during the process and provided it is before publication your data will be removed from the research database and not used in any further 1/21/202p2ublications.

The consent you provide is to be an **anonymous participant- no identifying information will be shared in any publications or outputs from the study**. No data will be connected to you as an individual, and no personal information will be disclosed if and when this data is published. Your participation in this study is voluntary; you can only participate by completing this online form. You are free to decline to participate and this will have no impact on your studies. This project has been granted research ethics approval by the TU Dublin Research Ethics Committee (Reference: REIC-21-43).

We would like to thank you for giving your time to be part of this research

If you have any questions about the study, please get in touch with John P. Healy on john.p.healy@tudublin.ie (mailto:john.p.healy@tudublin.ie)

Consent

PARTICIPATION IN RESEARCH IS VOLUNTARY. You are free to decline to be part of this study or to withdraw from it. Your decision will have no impact on your academic progress within your programme of study.

1. Name _____

2. Do you consent to participate in the above-described study?

☐ Yes, I consent to participate in the above study.

☐ No, I do not consent to participate in the above study.

3. Do you understand that you can withdraw your consent at any time?

☐ Yes, I understand that I can withdraw my consent at any time.

☐ No, I do not understand that I can withdraw my consent at any time.

Signed: _____

Date: _____

Appendix C

Interview Protocols

C.1 Game Designer Protocol

Interview Background

- My name is John Healy, I'm the educator and game designer conducting this research.
- My work explores the problem-solving process and creative methods employed by game designers.
- This is a conversation about your opinions and your own experiences, not facts or objective truths.
- There are no right or wrong answers.
- Any information used will be anonymised.
- Take as much time to consider the questions before answering.
- If you decide at any point that you would not like to be part of the study prior to publishing any findings I will ensure that your data is not included.
- All data will be stored on a recording device then transferred to an encrypted drive.

Pre-Interview Questions

1. I just wanted to confirm that you are ok with this conversation being recorded?
2. Are you okay with your answers being used in my research?
3. Do you understand that you do not have to answer if you don't feel comfortable?
4. Do you understand that you can stop the interview at any stage if you don't feel comfortable?
5. When you're ready, let me know and we can begin

Background

1. Can you tell me a bit about how you got into game design?
    (a) Educational background
    (b) Professional background
    (c) Current employer, role and duration
2. How long have you been a game designer?
3. Can you tell me the types of games you've worked on?
4. Are there any moments or experiences that stand out in your professional development?
    (a) Any mentors or individuals who influenced your career?
5. Are there aspects of being a game designer that you particularly enjoy?
    (a) Is there anything you particularly dislike?

Design Process

1. Could you describe your design process as it applies to a recent game you worked on?
    (a) How long was the project from start to finish?
    (b) How many people worked on the game?
        i. If it was a team how did design fit within that structure?
    (c) Did your work as a game designer change during the different stages of the project?
    (d) If the project is complete would you consider it a success of failure?
        i. Why?
        ii. Do you think you had an impact on this outcome? Explain.

2. How would you describe the game design process?

    (a) For example would you describe game design as a problem-solving activity, a creative exploration, etc.?

Design Challenges

1. What sort of challenges do you face when designing a game?

    (a) Are there specific types of design challenges you encounter repeatedly or are they varied?

2. How long does it normally take from identifying a challenge to resolving it?

3. Who is involved in resolving it?

4. Who approves design decisions?

Design Solutions

1. How do you generate ideas?

2. Where do they come from?

3. How many design solutions do you consider before deciding how to proceed?

4. Do you conduct research into possible solutions?

    (a) If so, what sources do you use?

5. How do you pick the correct solution?

6. Do you define success criteria at the start of a project or does it emerge during development?

7. Do you ever find yourself becoming fixated on design solutions?

Modelling

1. Do you use any strategies or tools early in the design process to communicate design concepts? (Sketching, prototyping, etc)
   (a) Do the forms of modelling you use vary by the phase of the project?
   (b) How effective do you find modelling at evaluating features?
   (c) Do you share models?
   (d) Do you iterate upon them?

Creativity

1. How would you define creativity in the context of game design?
   (a) Is creativity part of your design process?
   (b) How do implementation and creativity interact?
   (c) Is game design about creativity or problem solving?

Is there anything you would like to add?

Debriefing

1. Are you still comfortable to be part of the study?
2. Would you like me to forward a copy of any publications arising from this research?

C.2 Game Design Educator Protocol

Interview Background

- My name is John Healy, I'm the educator and game designer conducting this research.
- My work explores the problem-solving process and creative methods employed by game designers.
- This is a conversation about your opinions and your own experiences, not facts or objective truths.
- There are no right or wrong answers.
- Any information used will be anonymised.
- Take as much time to consider the questions before answering.
- If you decide at any point that you would not like to be part of the study prior to publishing any findings I will ensure that your data is not included.
- All data will be stored on a recording device then transferred to an encrypted drive.

Pre-Interview Questions

1. I just wanted to confirm that you are ok with this conversation being recorded?
2. Are you okay with your answers being used in my research?
3. Do you understand that you do not have to answer if you don't feel comfortable?
4. Do you understand that you can stop the interview at any stage if you don't feel comfortable?
5. When you're ready, let me know and we can begin

Background

1. Can you tell me a bit about your background and how you got into teaching?
2. What areas of game development do you teach?
    (a) Do you teach game design, if so, at what level?

Design Process

1. Could you describe how you structure game design projects for your students?
2. Is design generally an individual or a group activity in your classes?
3. Are there specific pieces of design advice you encourage students to consider in their projects?
4. How would you describe the student game design process?
    (a) Does it differ in your experience from professional/industry approaches?

Design Communication

1. How do students present their design concepts to you? Are there informal and formal approaches? How do they differ?
2. How do you provide feedback?
3. Are students receptive to the feedback?
    (a) Are they open to changing their mind?
4. Do the concepts change much throughout development?

Design Solutions

1. Do students use any methods or techniques to generate game design concepts?
2. How many concepts do students develop as part of their process?
3. Do they conduct any research as part of their process?

Creativity

1. Do students use any methods or techniques to generate game design concepts?
2. How many concepts do students develop as part of their process?
3. Do they conduct any research as part of their process?

Fixation

1. Do you find your students become fixated on early concepts or games they're playing?
2. Do you try any strategies to address fixation if it occurs?
3. Would you be open to using tools or techniques to support students to explore the possibility space more thoroughly?

Is there anything you would like to add?

Debriefing

1. Are you still comfortable to be part of the study?
2. Would you like me to forward a copy of any publications arising from this research?

Appendix D

Game Designer Qualitative Coding

D.1 In-Vivo Codes and Categories for Practitioners

Being Inspired by Other Designers
meeting other indie game developers
met other game designers

Miyamoto
Their sense of fun and creativity

Taking Inspiration From Games
built it on the pillars of all these giants
corner of games that no one is looking at
grew up playing games
how has X done Y?
playing other games

Being Playful
a lot of fun to develop

giddiness
playfulness

Taking Time
absorb that document for a month or two
boom, you know, you have an idea
calendar time
it just takes time
not setting up a schedule from day one
not thinking about it
pre-thought
resolve the problem better later
spend time looking
you have to be looking for it and then you'll see it

Exploring the Design Space
an exploration
creative exploration
creative leap
discovering something new

driven by your feelings
figuring out how to design the game
I want to do something new
serendipity element
what is it that this game is about?
what the foundation is

Dealing with Risk
a big unknown
easy to make missteps
identifying the risky areas
risking everything at this age and having it work out
willing to make mistakes

Finding Connections
finding connections

Living With Uncertainty in Design
constant state of inadequacy

make those connections
seeing a connection
solves 10 other problems

dark nights of the soul
excited and motivated and scared
games that take you on a journey
if you don't believe in your game, how are players going to believe in it?
pressure of trying to find something
scared shitless
thrown into the deep end

Finding the Creative Spark
creativity as like the spark
trying to do something new
what is the spark

Capturing Designs
brain dumping ideas
capture all those ideas
written on paper

Looking Beyond Games
Being exposed to that very different world
didn't just have to be a video game
flesh out
learning from the past

looking abroad

non-game activity

research is usually conceptual
tools and the technology
You need to have that grounding for it first but I think as diverse a set of inspirations as possible

Bouncing Ideas Off Others
a collaborative art

back and forth
bounce ideas off
having someone that you can bounce off
his strengths really compensated for my weaknesses
lucky to work with like, really cool people

Working Under Pressure
every day that we burn, without knowing what we're doing, costs money
sometimes deadlines are extremely helpful
throws a bucket of water on you
tight deadline
time and work-life balance
time is the issue

Collaborating With a Team
involved in a much earlier stage

lending their own expertise

nature of the team
working with the programmers

two days to make this game
you want immediacy

Communicating Game Designs
communication
design documents that are visual
explanations of certain mechanics
its a foundation
team are informed
visual communication is more valuable

Getting Buy-in From Others
buy-in from the rest of the team
convincing other team members

Harnessing the Creativity of Others
design discussions
harness all the ideas
harnesses great ideas
sometimes get different ideas
they come up with something better

Developing a Repertoire
define yourself as a designer
My focus
My methods
my strength is
repertoire of unusual design solutions
rules within a tradition
using your weaknesses as strengths
What is your style?
where I feel comfortable
where my sort of predilections skew

Owning the Game Design
always a stakeholder
blurry lines
doing whatever needs to be done
final approval
I wanted to make my own games
my original creation

Maintaining a Vision
a couple starting points
everything came from this
having conviction
I start with the idea
vision

Feeling a Sense of Personal Achievement
a big moment for me
commercial success versus personal success
critically and commercially
definitely a success
happy with the game
my first actual published game

Figuring it Out

being deliberate
clearer now too in your head

constantly coming up with ideas
do it in their head
gut checks
tease it

our first big game
setting really high goals
whose definition

Analysing Problems
breaking it down
breaking it down into
design is problem-solving
figuring out
formulate what your problem is
puzzle solving

Finding the Root Cause
but why?
figuring that out is that core knot
the actual root of the problem
the root cause

Understanding Trade-offs
be ready to change quickly, and then commit hard
game creation is about trade-offs
which compromises to make

Recognising Good Enough Designs
good enough

I still don't think it's good enough
is this system good enough

Understanding What is Feasible
'a Molyneux idea'

prototype to demonstrate that I could do it
that thing and isolation would be very cool
the greatest ideas. But until they're workable

Reusing Elements
it started as two failed board game prototypes
reuse existing systems

reusing things

Killing Your Darlings
it's not too hard to swap
it's really painful
kill your babies
kill your darlings

Simplifying Elements
difficult for ourselves
gets quite pragmatic
it's not elegant, but it would work without having to do all of that

Designing Every Game is Different
adapting into a digital game
board games, also, but also digital games

Thinking Holisticly
big picture issues
how every piece of the game interrelates

different genres also have different ways of being designed
doesn't work for the kinds of games
every game is a different problem
Every game is different
there's a million different approaches

it's every element of the game

structure is like this key element
the bigger picture

Finding Ways to Marry Narrative and Mechanics

find where the game mechanics will express things
narrative and how it shapes mechanics
story and the themes all interrelate
theme and the mechanic directly line up

Playtesting the Game

at the end is playing

playtest it
playtesting fundamentalist

Thinking as a Player

conventions they might be familiar with
how does that develop
how it evolves
how other players interpret and fill out the gaps
putting your feet into the shoes of players
who's going to play it

Thinking of the Player

audience interaction
culture of gamers
enrich their lives
player figured out something that you did not foresee
seeing people engage with it

Implementing the Design

implementation I think is a negotiation
Implementation is the experience

implementation is the limitations

it's through implementing it that you can see what works

technical challenges
the ability to make stuff

Blending Between Idea and Implementation

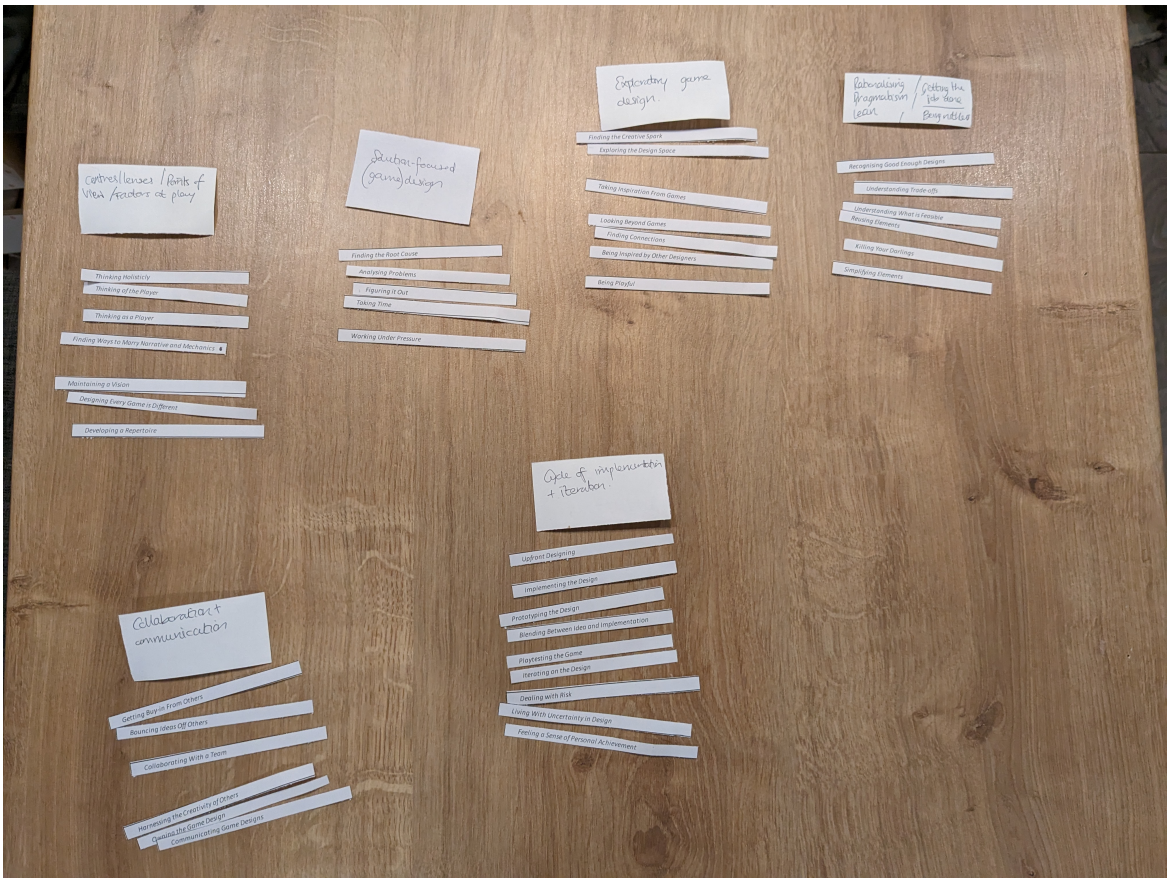
blend creativity with execution
blending literally the creativity and the implementation
the dialogue between the idea and the implementation and knowing how to negotiate that
the problem with focusing on implementation is that we can lose sight of what the idea is

Iterating on the Design
a lot of iteration
always iterated on
building and iterating
designed in a bubble
evolutionary process
iterate over the whole thing
through experimentation
we just ended up there

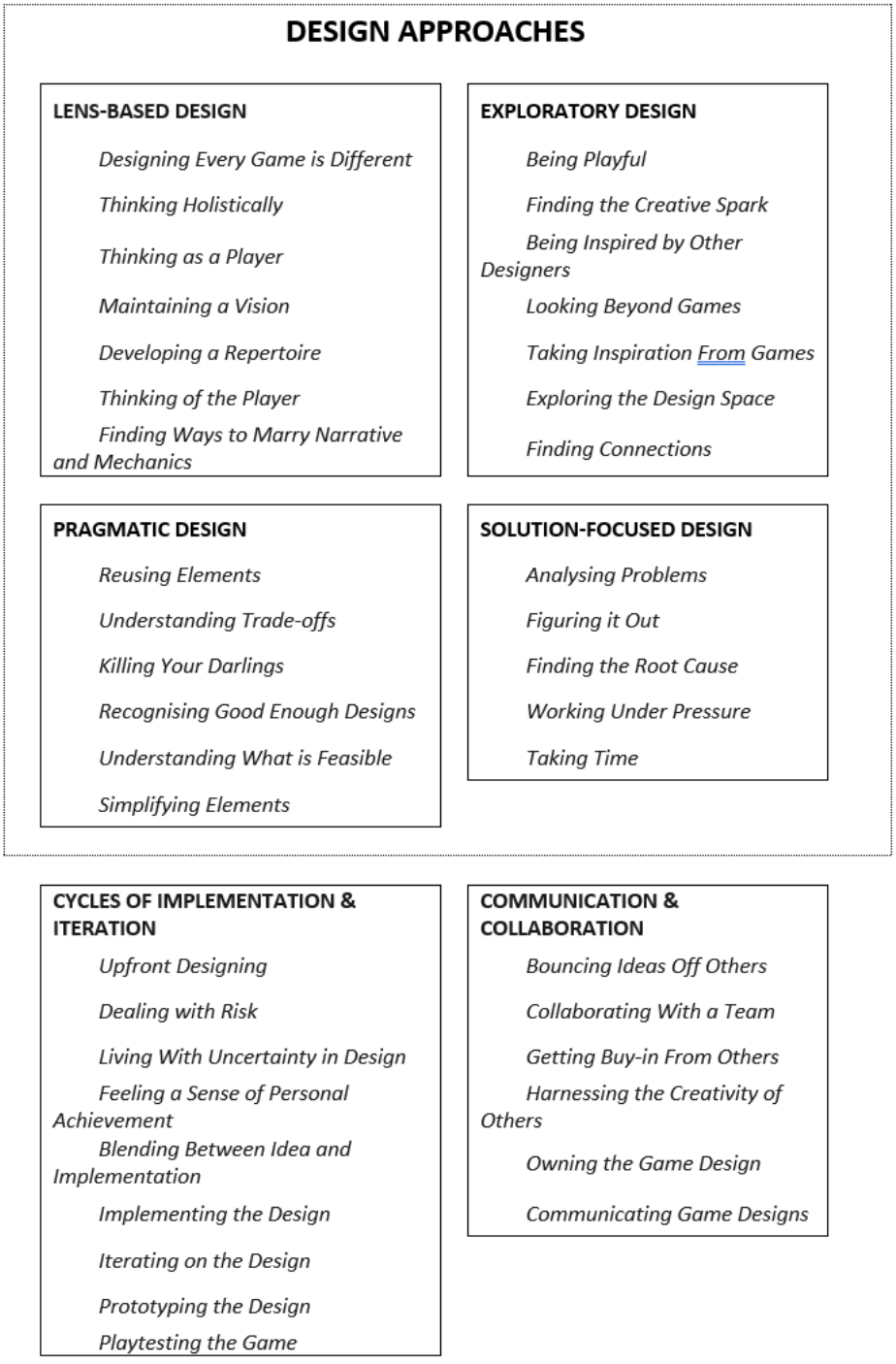
Prototyping the Design
100 Versions
low fi
prototyping and making stuff
same process
small prototypes

Upfront Designing
a roadmap
a system that can accommodate that
harder to iterate
honeymoon phase
upfront is kind of important

D.2 Code Mapping for Practitioners



D.3 Theoretical Map for Practitioners



Appendix E

Game Design Educator Qualitative Coding

E.1 In-Vivo Codes and Categories for Educators

Being Articulate About Their Designs

defend the process and the design decisions that they've made
for them to develop the language to be able to express their own design decisions
tell me why you've made that design choice

They couldn't justify why they've done it they just thought it would be cool
they tend to replicate the same things over and over again
to be able to articulate the why

you know, all the sub-processes to make a thing that you want to make

Making Design Issues Visible

being so scared of failure

if I acknowledge that problem, then I've got to fix it

I'll tell you what I think is wrong with it and then you need to go away and come up with a way of fixing that
It's like, the basic things that sometimes they leave out, they have these grand visions of the game
record the problem, not the solution

There's nothing about this game that will make someone play it
they feel a little bit embarrassed at this stage
they get demotivated as production goes on
they've been told multiple times
you got 15 minutes like, how long do you expect me to spend inside an inventory system

Pitching Games

almost entirely about the pitching process
describe and sell ideas
one sentence game designs
pitch deck

pitching the idea

PowerPoint and talk us through their ideas and their references

Providing Feedback

feedback

feedback and discussion
feedback is useful
getting feedback is a crucial aspect of it
how do you appropriately give feedback so that students you know, take it on board
learn to embrace feedback

present your game idea

USP without sounding

which ones have legs
you have to be able to communicate
you need to tell us what kind of plans you have

suggesting some things that might be worth considering
taking it on board and are making changes and edits to the project
they can get a bit protective about stuff
they won't admit they're not working
when I suggest something, they tend to take it on board
written feedback can become important

Communities Within the Programme

a collaborative kind of brainstorming
create a sense of community

separated into these kind of tiny little groups
they know each other a bit more and they can be a bit more comfortable around each other as well
trying to build up a community of support and get them comfortable
very interactive session

Groupwork

close collaboration

design works as an individual practice but also as a collaborative group exercise
group work module

group-based

in teams developing a game

It depends on the group
it has to be a group activity
make them comfortable with working in groups
students are put into groups
they all have to come to some sort of agreement

Individual Responsibilities

allowing students to take responsibility
individual contribution
presenting on behalf of the ideas of everyone
some students to hide their skills or to hide behind the strengths of others
the onus on them

Peer Relationships

ask each other questions

fear of peer criticism and pitching
informal peer-to-peer presentations

lots of peer criticism

present to their peers

they got to use their kind of specialist role
you don't want five people on the team with new stuff

sharing your work with others and getting feedback
talking between other peers to kind of develop an idea
that's usually easier than seeing what's wrong with their own

Assessment of Design
a scrapbook approach

I think students have become more and more fixated on grades
I want to see your work in progress
individual assessments help students to be able to identify the strengths and the weaknesses
moved away from design documents

not necessarily stuff that's assessed as a group
prototype and do design documents
sell sheet or a document that would then be used as a foundation for starting with pre-production
the assessment was just a game design document
we use kind of like the marketing descriptions
you need to show evidence

Dealing With Academic Time
how much they have to do in a couple of years
I just don't think there's the time

short a period of time it is
this is all just down to us not having enough time in our curriculums

three months of pre-production, and then three months of actual development

Dealing With the Structure of Academia
course with a bit of everything

the imperative to just recruit as many as possible
universities and higher education structures are set up in a way to almost fall into the waterfall-based production

Employing Formal Design Exercises

create an interactive room, in Unreal Engine
design pillars

Gamestorming

vary from module to module

We have 100 students in first year at the moment so it makes it quite difficult
what are they getting from being here that they wouldn't get if they just sat at home and watched YouTube and fiddled around in unity and read some books
working under the constraints of the module

I like the Sid Meier thing about double it or halve it
making something to learn

morphological analysis

surrealist games

that kind of gets to the point where it's so abstract it's sort of not really a design tool
used to teach MDA and then we started teaching DDE just because the term specifically the term esthetics is really difficult for undergrads
very small exercises
we do design pillars, I really struggle with the... the language around design pillars

Setting Design Constraints

it had to be focused on narrative

it had to have characters and like a narrative thread
it's going to fit these very, very specific briefs and they're all going to be different and that's going to teach all these different perspectives
it's got to be something very concise and constrained
Let's give them like a solid amount of constraints

the shoot 'em ups not allowed to be a spaceship
then they kind of get a stretch goal

Setting Project Milestones

I don't think you should be entering production until you can kind of like articulate these things
make sure that they're kind of goal orientated
milestones every week

steps and milestones

telling them that this isn't a good idea and they need to go back and reevaluate isn't that they failed
the timings of asking for feedback

this week, we want you to focus on

we don't want to make the same game again, type of thing. So we try and put constraints on them.
We set constraints in there as well

weekly goals to hit

working with like set milestones

Structuring Game Design Learning

do the same thing again

give them a theme
it's usually quite structured

set them a small task

structuring the production for them

theme first

they found it easier to navigate because they felt like their hand was being held enough
very tight rails for the first couple of weeks
very, very structured
we try to bake in checks and balances
weekly presentations
whittle it down

Student Motivations

I find that the students who are the best engage with that, the rest, not so much
it's usually the type of student
more so in those that are more forthcoming
the better students are more receptive to feedback and implementing that feedback
the ones who genuinely do want to work in games are receptive
they're not really here to become game designers or game developers or anything

The Nature of Student Designers

It depends on the students
It depends on the students really

So it does depend on the student
some people just aren't creative

some students don't like getting feedback
some students maybe don't take the advice on as much as others

Tutoring Students

I gave them guidance
I walk from team to team, just have a chat about like
informally sit down with the students
It's much more about having a conversation with them
the things we talked about, these are the things you need to work on
they have an art tutor as well

students are students, and sometimes they try and skip steps
students often want to go off and go for the end product before the start

Focusing on a Process
by the third or fourth time they are feeling more confident
full process

it all comes down to the process
it's also process focused

process is important

show iteration, experimentation, research and some sort of collaboration
take students through a certain pipeline
take time to go through a process
the process that we're asking them to follow
they've spent so much time going over the same process

this is the process that you go through

Iteration
build, test, evaluate, iterate
building on those early sort of prototyping ideas

I want them to test it, and I want them to iterate on it and I want them to show me that they're going through the process
iteration is really the big thing

they kind of want to chat through it

Implementing Game Designs
focus is on the implementation and game prototyping
It's a prototype, it doesn't need to be big
showing not telling
they do make it work in engine and they bring all this together
they have to actually implement the stuff
you can't teach design on its own without implementation

you need it in motion to understand whether it works or not
you need to be able to make
you're all making things

Pre-Production
period of pre-production
they just can't believe that anything that glossy starts off as scribbles and nonsense
they tend not to be really interested in the pre-production type of stuff or they don't believe you can start that way

working out everything on paper, or Miro boards before actually doing anything implementation wise

making them iterate and saying, the way you get your marks is by iterating

Generating a Volume of Ideas
all the ideas

asked them to think broadly

coming up with ideas
encourage students to think laterally before they then refine and scope their ideas down
proposing different solutions
really explore ideas first

research and broadening out our understanding
the value is in coming up with so many ideas
think about the idea broadly

think more broadly
try and give them the space

Generating Original Ideas
a real activity that you have experience of
a VR module so like, that's where we tend to get the more experimental stuff at the start blue sky
I expect them to have known how to come up with the ideas based on what I'm asking them to do
I want to see their creativity
it's much more theoretical, so it doesn't really matter whether or not they can implement the thing
think outside the box

three is the magic number isn't it

use that design bias as an opportunity to brainstorm
very different concepts
we do brainstorming

Getting Fixated in Design
a way of getting a group of people to fixate on something
changing things about your game is inevitably gonna make it better
don't have that bias towards a first idea or a strong idea
it doesn't get changed, because they can't break that
they get fixated on just piling more and more things into their games
they're finding out that their idea maybe wasn't the best one

Appropriate Scope
a lot of it comes down to scope

function creep

is actually properly scoped

keeping it simple

maybe we don't have time

scope is always a concern,

they're kind of creating a fundamental friction between the way that they want to deliver content and the type of game they're making
you've just had to spend four weeks following tutorials'

that's not going to be possible

there's quantity and complexity

they're not under scoped and that they're not over scoped
we've got four weeks until it has to be completed
what they present scope-wise is really big

Analysing Games
analyse and digest that the hierarchy and the prioritisation of features within games
case studies
how do they work

it all fits together
learning how to talk about existing games and talk about how they work

one of the hardest things I find is getting them to analyze and talk about existing games
playing games with that critical eye
show them an existing game, and then to ask what would happen if I change this to this
So that they can actually then talk with some authority
This is why the designers did that and that works with that in this way
what's it about
you break it down based on what you see
we look at game examples

Conducting Research
it is research

research into that role
researching and understanding the problem
researching markets
they have to research into that particular aspect of how to develop themselves
they never do research

Designing Different Types of Games

every game has a really crunchy set of progression mechanics and all of this other stuff
narrative media

the thing that's difficult about games is there is so much variation between all of the things that we call a game
there isn't necessarily a set, valid order of operations for designing a game
understand the type of game they're making

Designing For a Player

broaden the perspective and the mindset of who you're making games for
build up in an initial structure for an initial user experience
it's gonna have an impact on people whether they want it or not

otherwise they can't understand the player experience

playtest games as much as possible

someone else has interacted with it who are they making games for

Developing a Design Repertoire

allowing students to be creative and follow their own practice or identify their own practice within a framework
allowing them to learn that is an important lesson
creative processes being in your own bubble
experiment and play around with them and see what comes up
find their own voice
how they're, they're developing as designers as well
it's not prescriptive to say that students need to use it they can use other techniques that we use as well
letting them kind of flourish, you know, during production

students have their interests and want to make the type of games that they're playing

take some of the extremes

Thinking as Game Designers

a situation where you're not the expert

build a base of experience that you're drawing from
demonstrate particular approaches

emphasize the importance of things like thumbnail sketching
fundamentals of game design
it's almost like teaching someone how to cook
it's trying to find the balance

looking at game quality as a tester and then applying our understanding of game quality as designers as well
play is less about like winning or being successful and it's more about the process of play, and the creativity and collaboration that happens during play
playing and being playful

they put their own spin on it in a way
they will default to the things that are most familiar to them
they're brave enough to have a go
what is the role that you want to go into when you go into industry
what they gravitate towards
your creative intuition

rules for designers
teach them what a verb and a noun is

teaching goals and actions
thinking holistically

to get them thinking as designers
trying to expand their horizons

Acting as a Producer
acting like producers
it would be good if you did this thing with this game
Just to keep them on track
regularly check in on people and try and nudge them
show them that different things are valid
steer them
the producers in a way, you know, trying to steer them
we would try and do is steer it in a way
we'd help prioritize certain things for them as well
you want to make this thing and we're going to try and help you make it the best version of the thing you want to make

Development of Soft Skills
development of soft skills
employability type stuff

help them address those skills

Getting First-Hand Experience
design and production are skills that are sets of tacit knowledge that you pick up by doing them over and over again
it's very hard for them to care about all of that until they get to this certain level of it
let them make their own mistakes
they have to work out themselves

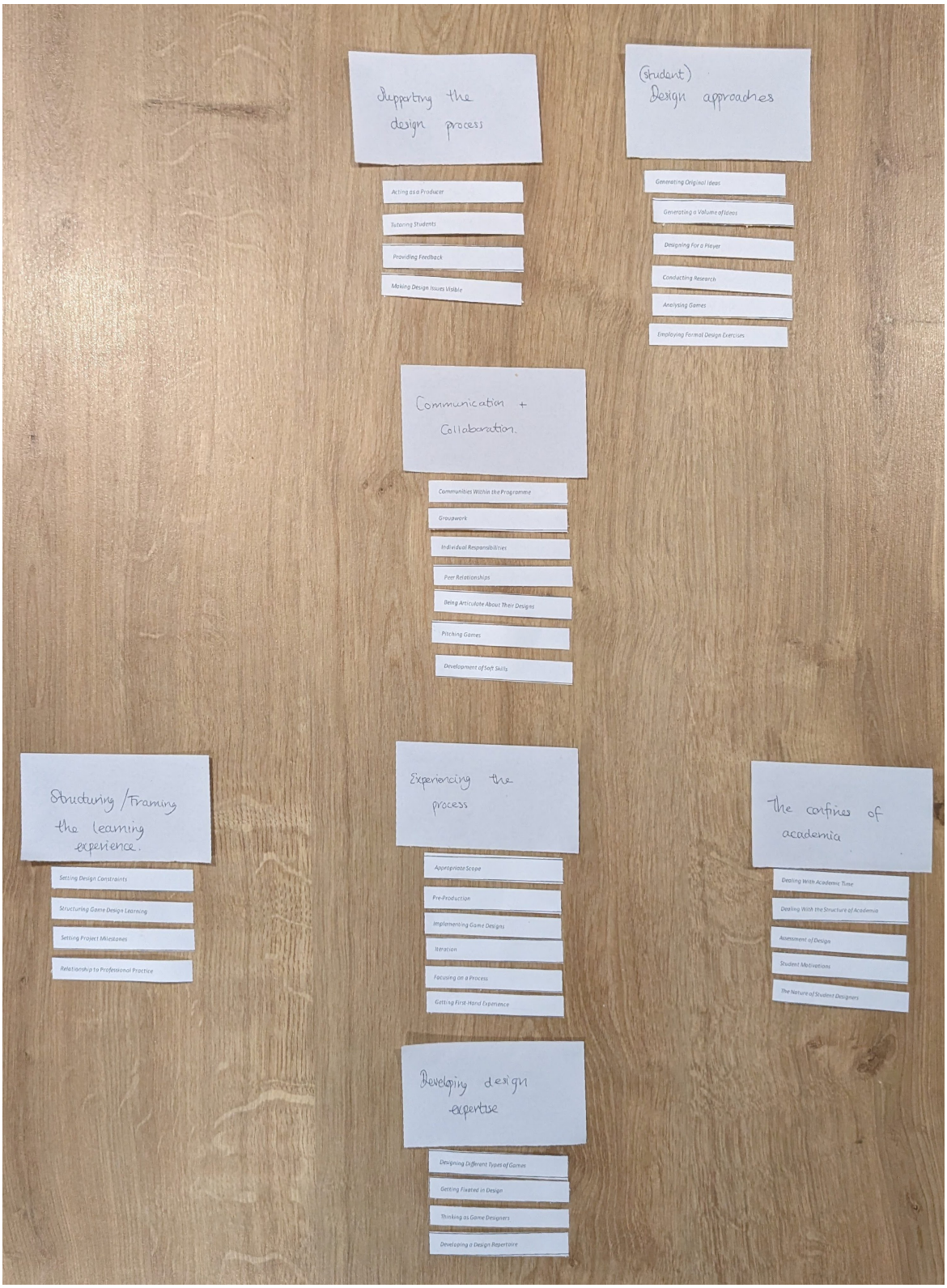
Relationship to Professional Practice
are major things that industry have looked at

I ask them to do features specifications

mimic a studio environment
normal development cycle

trying to inculcate a bunch of knowledge that is very tacit and gut feeling *when you ask them to explicitly but they won't do it of their own accord*	*polish in real life versus polish for student work is completely different* *some industry people we had some people from Epic come in* *the game production methodology that we use* *there's all this secrecy in the games industry* *you're teaching them professionalism, part*

E.2 Code Mapping for Educators



E.3 Theoretical Map for Educators



Appendix F

Student Qualitative Coding

F.1 Line-by-Line Codes and Categories for Students

Designing Variety
Designing for ambiguity
Designing for future features

Designing for repeated playhthroughs
Designing multiple options
Designing placeholder mechanics
Designing variations

Taking Inspiration
Analysing design solutions
Creating features due to genre expectation
Designing with genre
Getting inspiration from other media
Taking inspiration from other games

Open-Ended Design
Designing around a core gameplay goal
Designing freeform
Designing in engine
Designing options
Designing with a vision
Designing with specific intent
Designing with vision and flexibility

Developing with open questions

Early ideas
Using fucntionality witout design

Designing for Player Understanding
Building on players mental models

Considering player experience
Considering user interface
Designing game UIs
Overlooking core player experience
Reinforcing player knowledge
Suggesting gameplay based on mental models
Thinking through design as implementation and player controls
Understanding Player Expectations

Solution-Focused Design
Adapting other approaches to solve problems
Adding deeper meaning
Adding design constraints

Brainstorming ideas

Breaking problems into smaller steps
Combining ideas
Designing gameplay to control information flow
Focusing on core elements
Generating alternatives

Visual Design
Considering aesthetic style

Considering the importance of lighting
Considering the interplay between visuals and gameplay
Considering thematic and visual elements
Deciding on aesthetic choices
Designing visual elements
Generating gameplay concepts based on visual elements
Iterating on visual design
Researching visual elements

Generating ideas
Moving beyond inspiration
Preempting design issues

Progressing the design with implementation
Reusing elements

Scrapping ideas

Solving one problem helping with others
Using simlicity as a design approach

Sketching level layouts
Skething game concepts
Using art direction to impact the palyer experience
Using art to stand out

Using colour to communicate gameplay
Using lighting to communicate gameplay
Using visuals to communicate gameplay
Visual design following game design

Playtesting
Accepting player feedback
Accepting player feedback and developing solutions
Adjusting design to improve player experience
Balancing player experience with gameplay goals
Clash between paper and engine designs
Demonstrating mechanics to players
Gaining insight through playtesting
Identifying routes to improve experience
Negotiation between experience and implmentation
Player experience differing from design ambition
Player feedback
Receiving beneficial feedback
Rejecting feedback
Uncovering issues through playtesting
Using playtesting to refine the design

Designing for a Player
Communicating with the player
Defining player progress

Designing for failure

Designing for genre expectations

Designing for player agency

Designing for player experience
Designing for player expertise
Designing for player progress

Designing for player progression

Designing NPCs

Encouraging player interactivity
Subverting player expectations

Narrative Design
Balacing gameplay and narrative
Considering narrative as a design element

Considering player actions
Building on players mental models
Communicating with the player

Using narrative
Using narrative and worldbuilding to motivate palyers
Using narrative to communicate to the player
Worldbuilding

Considering player actions
Considering player experience

Considering user interface

Suggesting gameplay based on mental models
Thinking through design as implementation and player controls

Creating Custom Game Elements
Building on existing gameplay
Changing the camera to suit the gameplay
Creating custom interactions
Creating systemic elements
Customising gameplay

Designing around technical challenges

Designing for technical details

Expanding engine functionality
Implementing unique hook mechanics
Increasing game difficulty
Iterating through designs
Modification and iteration
Organising the code
Recognising the complexity of game systems
Simplifying design to allow expansion
Thinking about how elements interact

Level Design
Building a realistic space
Communicating with the camera

Designing believable spaces
Designing game cameras
Designing game spaces for constraints of the perspective
Designing in conversation with worldbuilding
Designing multiple ways to access spaces
Designing the levels
Gating player progress
Guiding the player
Introducing gameplay mechanics
Introducing mechanics to players
Introducing the player to mechanics
Pacing gameplay elements

Tutorialising the gameplay
Using a sandbox to test mechanics
Using space as a gameplay element

Creating Base Game Elements
Creating a testing ground
Creating basic functionality
Designing placeholder mechanics before implmenting complex versions
Developing base mechanics
Developing basic gameplay mechanics
Implementing basic functionality

Individual Factors
Applying multidisciplinary skills
Comparing features across tools
Drawing on experience as a player

Enjoying the process of using the tools
Setting personal goals
Taking on individual responsibility

Implementing quickly as opposed to by the book
Planning for future iteration and refinement
Using game engine features
Understading personal limitations

Teamwork
Allocating team roles
Building consensus
Communicating with a team
Developing team roles
Documenting design
Ensuring shared vision
Forming teams
Identifying how roles interact
Meetings during development
Negotiating group work
Working as a team

Developing Design Expertise
Developing expertise
Developing professional skills
Developing skills through practice
Enjoyment of process
Evolving design approach
Learning and personal development
Learning by doing
Moving forward after overcomming obstacles
Personal satisfaction
Pride in what was acheived
Satisfaction on completion

Accepting Design Outcomes
Accepting bugs within the design
Accepting the dynamic nature of game development
Being unable to resolve technical challenges
Cutting features but retaining uneeded functionality
Cutting planned features
Decreasing scope
Developing awareness of the problem with over scoping
Difficulties achieving vision
Difficulties implementing custom gameplay
Failing to overcome techncial challenges
Getting focused on narrative and worldbuilding over gameplay
Lacking polish
Outlining plans for future work

Managing Production
Complexity of roles
Considering the relationship between disciplines
Defining production goals
Designing across disciplines
Interactions between disciplines
Playtesting milestone
Preparing for a playtest deadline
Relationships between disciplines
Setting up project management workflows
Understanding of sub disciplines
Understanding the time available
Working across disciplines

Recognising what is important to player experience
Reducing scope due to time and technical challenges
Regretting lack of player agency in ending
Running out of time to implement a level

Externally Initiated Game Design
Encountering bugs
Encountering bugs that players wouldn't notice
Encountering issues between aesthetic and gameplay choices
Encountering issues when designing
Encountering issues with designing for 2D
Encountering technical issues
Encountering technical issues late in the day
Encountering unexpected behaviours
Encountering unexpected issues
Reworking functionality based on feedback

Self-Initiated Game Design
Adding features through development
Checking for issues
Design goals
Identifying opportunities to improve
Iterating on game design
Outlining the high level concept
Setting design goals
Solving self-created problems with additional mechanics
Struggling with theme

Technical Challenges
Identifying bugs and working through the cause and solution
Learning new software tools
Resolving bugs
Resolving technical challenges
Resolving technical issues
Testing an incomplete game
Testing buggy functionality
Testing solutions

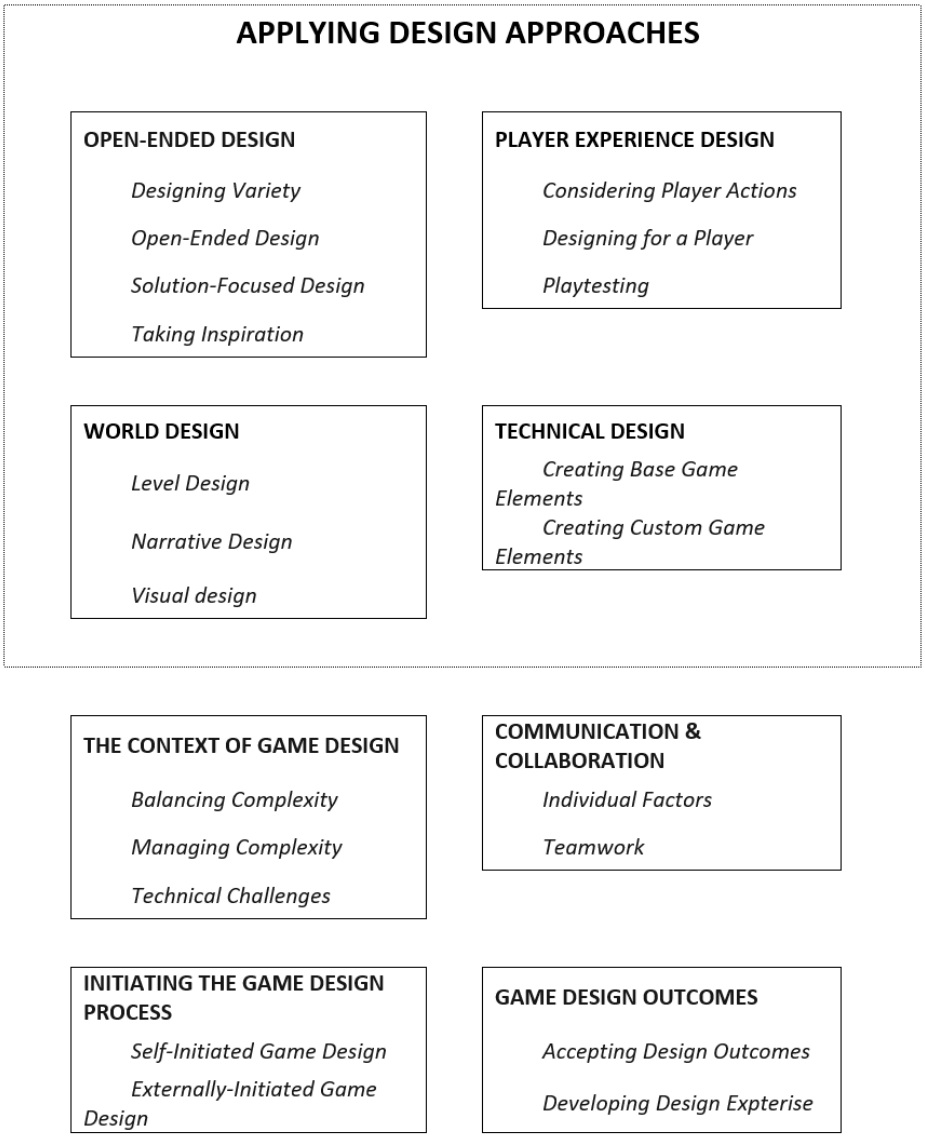
Balancing Complexity
Adding difficulty
Adding mechanics becuase of genre expectations
Balancing mechanics and player experience
Combining worldbuilding and visual design
Designing for complex relationships
Negotiating complex design challenges through implementation
Negotiation between implementation and production

Unforseen challenges
Using online resources
Working between software tools

F.2 Axial Coding for Students



F.3 Theoretical Map for Students



Appendix G

Game Tools Project Brief

BRIEF: THE WORLD WILL END IN FIVE MINUTES
MODULE: Game Tools 1
WEIGHTING: 50%

OVERVIEW
For this assignment, you are required to work in groups of up to 4 students to create a game around the theme **THE WORLD WILL END IN FIVE MINUTES**. You will develop a concept for the game and conduct a playtesting session. In addition to this you are required to create a development log (DevLog) on itch.io for the design process you followed including level concepts, whiteboxing, playtesting, iteration and final evaluation.

You are responsible for the level design, visuals and any custom gameplay. Where you use open source or publicly available assets these must be credited and referenced in your DevLog- failure to do so will be treated as plagiarism and as such is a breach of the General Assessment Regulations (http://www.dit.ie/qualityassuranceandacademicprogrammerecords/student-assessment-regulations/general/)

The learning outcomes for this project are:

- Demonstrate an understanding of how to develop a game map or scene
- Develop a level design workflow from paper to digital
- Demonstrate an ability to coherently implement and use a variety of camera modes
- Design a variety a genre specific game levels
- Demonstrate an understanding of GUI's and their relevance in different contexts
- Demonstrate an understanding of how to implement sounds in a scene
- Demonstrate an understanding of Level Content
- Design a play test session

PROJECT TIMELINE
21st March: Project Briefing
28th March: Concept Presentation.
18th April: Playtest.
11th May: Project submission.

FINAL DELIVERABLES You must submit the following on Brightspace by the due date and time above:

1. Link to itch.io public game release.
2. Dev logs detailing your design process. (Min 1 log per team mate of approx. 500 words and images).

This is a group assignment. Late submissions will not be accepted.

RUBRIC

The Game will be graded as follows:

- DevLogs of your design process. 10%
- Technical implementation. 20%
- Visual design & consistency 20%

Appendix H

Development of Initial Game Design Heuristic Set

H.1 Game Data Gathered For Heuristic Development

Game	Description	Themes
A Short Hike	Hike, climb, and soar through the peaceful mountainside landscapes of Hawk Peak Provincial Park. Follow the marked trails or explore the backcountry as you make your way to the summit. Along the way, meet other hikers, discover hidden treasures, and take in the world around you. Key Features Explore the island any way you like. Choose your own path to follow and see where it leads you. You never know what you might stumble into! Hike at your own pace — there's no need to rush to the summit! Take your time fishing along the river banks or swimming by the lakeshore. Collect hidden treasures to reach new heights. Try taking a dive off the mountain peaks to soar above the forests. Chat with the other hikers you meet along your route. You might be able to help each other out! Listen to a lush original soundtrack by Mark Sparling that progresses dynamically as you explore the wilderness.	#movement #emotion #environment #explore #meet #discover #self-guided #mini-games #collection #flying #help #soundtrack

Anodyne 2 - Return to Dust	Rescue A Mysterious Island From A Mind-Warping Plague Nano Dust infects the islanders of New Theland, distorting their emotions and desires. You play as Nova, a Nano Cleaner who must explore the island, seeking out the sick and shrinking inside their bodies to suction up the Dust. Anodyne 2: Return to Dust combines the thrilling scale and cinematic storytelling of 3D games with the tight design and easy-to-pick-up satisfaction of 2D Zelda-like adventures. With art that re-imagines the PS1 and N64 era, explore 3D cities, valleys, and wastelands then shrink into the varied 2D mindscapes of characters, from snowy, aurora-lit valleys to perilous volcanic construction sites! Features Jump, drive, and walk across gorgeous and haunting locales in 3D, speaking with strange and memorable characters. Vacuum up Nano Dust in 2D, suck up and fight enemies, all while overcoming mind-bending challenges related to the characters' inner lives. Experience the thrilling and emotional story of Nova. Her destiny is clear: she is the Nano Cleaner who will save New Theland. But strange characters & painful experiences will put her loyalty to the test... Choose where you want to go! The sweeping vistas of New Theland quickly open up to exploration. Access the outer reaches of New Theland by using magical Cards you will find on your journey. Transform into a car at will and quickly drive around the world. No need to call a horse! Fire your Spark to shrink into the bodies of the infected, explore the 2D Zelda-like dungeons within, and heal them. Enjoy the lush, dreamy and breathtaking 3D and 2D landscapes painted and pixeled by artist Marina Kittaka. Listen to over 50 new songs influenced by countless genres by Melos Han-Tani, perfectly fitting the varied landscapes of Anodyne 2. A Lush, Surreal Lo-fi 3D and 2D World. Anodyne 2: Return to Dust uses modern technology to reimagine old 3D art of the PS1, PS2, and N64 era, as well as the 2D art of the GBA and SNES. Each area captures a strong visual mood, with new characters to meet and sights to see.	#explore #recursive #finding #movement #environment #characters #combat #vacuum #puzzle #emotion #narrative #self-guided #cards #transform #shrink #dungeons #level-design #tecnhology #retro #mood #beauty

Eliza	Eliza is a visual novel about an AI counseling program, the people who develop it, and the people who use it. Follow Evelyn Ishino-Aubrey as she reconnects with people from her past, gets to know the people of Seattle who use Eliza for counseling, and decides the course of her future. After abandoning her high-powered tech career and a mysterious three-year absence, Evelyn Ishino-Aubrey resurfaces working as a proxy for a virtual counseling app called Eliza. Her job consists solely of reading a script provided to her in real-time by an AI, leaving her no autonomy over what she says. Is Eliza a technological marvel that brings therapy to those who otherwise couldn't access it? Or is it an ineffective replacement and another vector for technology companies to gain control over our lives and humanity? As she reconnects with people from her past and gets to know the ordinary people of Seattle who use Eliza for counseling, Evelyn finds herself caught in the middle between differing sides of the argument— and as she begins to question everything about her past life and future purpose in the world, it becomes clear she must confront the turmoil and darkness inside. A thought-provoking story told in the form of a visual novel from an award-winning indie team. Follow Evelyn's journey through a present-day Seattle brought to life with beautiful hand-painted art. Get to know Eliza's clients and the employees of Skandha, the technology giant behind it, with over a dozen fully-voiced characters and powerful performances from a highly regarded cast. An evocative, ambient original score by the composer for Infinifactory, SHENZHEN I/O, Opus Magnum, and EXAPUNKS. Is AI-driven counseling better than nothing? Is it worse than nothing? What responsibilities come with technical skills? Consider your own answers to these questions and more. Counseling sessions getting a little too real? Relax with Kabufuda Solitaire, a new take on solitaire using Japanese kabufuda cards.	#visual-novel #npc-ai #decision-making #characters #mystery #high-stakes #emotion #thought-provoking #beauty #soundtrack #self-guided #mini-games

Elsinore	On a summer night, Ophelia awakens from a terrible vision: In four days, everyone in Elsinore Castle will be dead. Even worse, she's been thrown into a time loop from which she cannot escape. Forced to relive the same four days over and over again, Ophelia determines to do everything in her power to change the future. Elsinore is a time-looping adventure game set in the world of Shakespeare's Hamlet. Elsinore combines strong social simulation elements, a dynamic story that reacts immediately to player decisions, and a world full of diverse characters with secrets to uncover. Can Ophelia prevent the tragedy that lies before her? Gameplay Elsinore is a point-and-click adventure game set in a living world where the story plays out around you in real time. Every four days time resets, and you gain another chance to change the fate of Elsinore Castle's inhabitants. Dynamic Story Engine: Elsinore uses a story simulation engine to determine which events occur based upon your interactions. Lie, forgive, gossip, befriend, or destroy — the actions you can take at any stage are numerous, and the game immediately responds. Intelligent Character Behavior: Each character manages their own lives, schedules, needs, desires, and plans over the course of each time loop. Even the smallest interaction has an impact on the world around you as it unfolds. Learn from Previous Loops: Whenever a time loop resets, Ophelia remembers anything she has learned from the previous world, allowing you to access new ways to play. Use Your Influence: Understanding each character's motivations isn't just part of the story. It's necessary for Ophelia's survival. Characters are complex and have long histories with each other; all of them are keeping secrets. Life-or-Death Decisions: In a Shakespearean world, most roads end in tragedy, and characters are quick to meet a grisly fate. Hard decisions and terrible trials force players to think on their feet.	#narrative #stakes #time-limit #looping #adventure #social-elements #dynamic-story #characters #secrets #self-guided #NPC-AI #learn #complex #high-stakes #decision-making

Katana ZERO	Katana ZERO is a stylish neo-noir, action-platformer featuring breakneck action and instant-death combat. Slash, dash, and manipulate time to unravel your past in a beautifully brutal acrobatic display. Exceptional Combat: Overcome your opposition however the situation requires. Deflect gunfire back at foes, dodge oncoming attacks, and manipulate enemies and environments with traps and explosives. Leave no survivors. Hand-Crafted Sequences: Each level is uniquely designed for countless methods of completion. Defeat foes creatively, using spontaneous approaches to eliminate your enemy as you see fit. Unconventional Storytelling: An enigmatic story told through cinematic sequences woven into the gameplay, twisting and folding to an unexpected conclusion.	#style #platforming #action #high-stakes #time-manipulation #acrobatics #dynamic-combat #self-guided #level-design #cinematic #unconventional-storytelling

Lonely Mountains - Downhill	Just you and your bike - take it on a thrilling ride down an unspoiled mountain landscape. Make your way through thick forests, narrow trails and wild rivers. Race, jump, slide and try not to crash - all the way from the peak to the valley! Explore the rich mountain worlds at your own pace or face the ticking clock. Each mountain features several trails - ride along quiet mountain lakes, majestic forests and steep canyons. A custom physics system lets you carefully drop from boulder to boulder, sprint over abysses or slide through muddy grounds. It's all up to you! Take the relaxing scenic route or go off-road to find the fastest way to the finish line! Master the tight and responsive controls to make your way to hidden resting places and secret shortcuts. No audience, no barrier tapes - experience a beautiful nature unspoiled by men. Unlock new difficulty modes and prove your speed-running talents on the leaderboards! Train your skills day and night to ultimately compete with the best riders in the world in the risky Free Ride mode! Each bike handles differently, so find the perfect one for your playstyle and make your way down the mountain to unlock dozens of paint jobs and outfits!	#environment #movement #acrobatics #action #self-guided #explore #time-limit #physics #controls #level-design #mastery #secrets #unlock #difficulty #competition #decision-making #customisation

Mutazione	• A lush, hand-illustrated world to explore • Ensemble cast of loveable mutant characters • A story with unpredictable dramatic twists and turns • Gardens to customize for unique relaxing musical soundscapes • Seed sharing - send and receive rare and unusual seeds with your friends A mutant soap opera where small-town gossip meets the supernatural... MUTAZIONE is an adventure game where the juicy personal drama is just as important as the high-stakes adventure part of the story. Explore the community as 15-year-old Kai as she travels to the strange and secretive community of Mutazione to care for her ailing grandfather, Nonno. Make new friends; plant musical gardens; attend BBQs, band nights and boat trips; and embark on a final spiritual journey to save everyone from the strange darkness at the heart of it all. Over 100 years ago, the meteor "Moon Dragon" struck a tropical holiday resort. Most of the inhabitants perished, while those who survived began to show strange mutations... The rescue missions quickly retreated, and those who remained in the mutating environment founded the small and isolated community of Mutazione. Fast-forward to modern day, where you play as 15-year-old Kai as she travels to Mutazione to help nurse her dying grandfather back to health. But things aren't as simple as they seem... Nonno has other plans for Kai; secrets and betrayals simmer under the friendly community's surface; and there's a creepy bird-like figure who keeps on appearing in Kai's dreams. They can survive an apocalyptic meteor strike, but can they survive their small-town drama?	#environment #beauty #characters #narrative #customisation #soundtrack #social-elements #supernatural #adventure #high-stakes #explore #secrets #community #movement #mystery #dreams #survival

Patricks Parabox	Patrick's Parabox is a mind-bending puzzle game that explores a unique recursive system of boxes within boxes within boxes within boxes. Learn to manipulate the world's structure by pushing boxes into and out of each other. Wrap your head around what happens when a box contains itself, and learn to use infinity to your advantage. Explore more mechanics and recursive twists as you delve deeper and deeper into the system. It's boxes all the way down. The game has over 250 hand-crafted puzzles, which are designed to make you think, but also to guide you and showcase the beauty of the system. Each puzzle contains a new idea; there is no filler.	#puzzle #recursive #complex #learn #explore #looping #level-design #system #quality
Slay the Spire	We fused card games and roguelikes together to make the best single player deckbuilder we could. Craft a unique deck, encounter bizarre creatures, discover relics of immense power, and Slay the Spire! Features Dynamic Deck Building: Choose your cards wisely! Discover hundreds of cards to add to your deck with each attempt at climbing the Spire. Select cards that work together to efficiently dispatch foes and reach the top. An Ever-changing Spire: Whenever you embark on a journey up the Spire, the layout differs each time. Choose a risky or safe path, face different enemies, choose different cards, discover different relics, and even fight different bosses! Powerful Relics to Discover: Powerful items known as relics can be found throughout the Spire. The effects of these relics can greatly enhance your deck through powerful interactions. But beware, obtaining a relic may cost you more than just gold...	#fusion #deck-building #cards #discover #dynamic #decision-making #self-guided #risk-reward #items #system

Untitled Goose Game	It's a lovely morning in the village and you are a horrible goose. Untitled Goose Game is a slapstick-stealth-sandbox, where you are a goose let loose on an unsuspecting village. Make your way around town, from peoples' back gardens to the high street shops to the village green, setting up pranks, stealing hats, honking a lot, and generally ruining everyone's day. Featuring: A horrible goose (that's you) A town full of people just trying to get on with their day (you hate them) A dedicated honk button (!!!) Oh dear! Two horrible geese! You can now enjoy Untitled Goose Game with a friend, in a new two-player cooperative mode. Play through the whole game as two horrible geese, honking twice as much, teaming up to plan pranks, and generally ruining everyone's day, together. A free update for all owners of Untitled Goose Game Play through the entire game with two players New goose, new honk, still horrible	#player-antagonist #commedy #sandbox #stealth #genre-mix #movement #environment #npc-ai #multiplayer

H.2 Initial Heuristics Set Developed to Trial Game Ideation Tool

Adjust the Challenge
competition
complex
difficulty
risk-reward
stakes

Use the Environment
dungeons
environment
level-design
sandbox

Design for Control
acrobatics
action
characters
combat
controls
dynamic-combat
flying
movement
platforming

Design for Player Freedom
community
customisation
decision-making
dynamic
explore
high-stakes
player-antagonist
self-guided

Think of the Emotional Impact
beauty
cinematic
discover
dreams
emotion
learn
mastery
mood
quality
retro
soundtrack
style
supernatural
thought-provoking

Consider the Genre
adventure
commedy
deck-building
fusion
genre-mix
mini-games
multiplayer
mystery
puzzle
stealth
survival
visual-novel

Manipulate Time
looping
recursive
time-limit

Refine the Narrative
dynamic-story
narrative
secrets

	unconventional-storytelling

Use Custom Mechanics
cards
collection
finding
meet
npc-ai
physics
shrink
social-elements
system
tecnhology
time-manipulation
transform
unlock
vacuum