2010

The Nature of Complex Blends: Transformative Problem-Based Learning and Technology in Irish Higher Education

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Cases on Online and Blended Learning Technologies in Higher Education:

Concepts and Practices

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A volume in the Advances in Mobile and Distance Learning (AMDL) Book Series

Information Science REFERENCE
An Imprint of IGI Global

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Typesetter: Michael Brehm, Kurt Smith, Jamie Snavely
Cover Design: Lisa Tosheff

Published in the United States of America by
Information Science Reference (an imprint of IGI Global)
701 E. Chocolate Avenue
Hershey PA 17033
Tel: 717-533-8845
Fax: 717-533-8661
E-mail: cust@igi-global.com
Web site: http://www.igi-global.com

Library of Congress Cataloging-in-Publication Data

Cases on online and blended learning technologies in higher education : concepts and practices / Yukiko Inoue, editor.
p. cm.
Includes bibliographical references and index.
ISBN 978-1-60566-880-2 (hardcover) -- ISBN 978-1-60566-881-9 (ebook) 1. Education, Higher--Computer-assisted instruction--Case studies. 2. Educational technology--Case studies. 3. Blended learning--Case studies. I. Inoue, Yukiko.
LB2395.7.C417 2010
378.1'734--dc22

2009034981

This book is published in the IGI Global book series Advances in Mobile and Distance Learning (AMDL) Book Series (ISSN: 2327-1892; eISSN: 2327-1906)

British Cataloguing in Publication Data
A Cataloguing in Publication record for this book is available from the British Library.

Chapter 1
The Nature of Complex Blends:
Transformative Problem-Based Learning and Technology in Irish Higher Education

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ABSTRACT

This chapter discusses the complexities of blending technologies and problem-based learning (PBL) group interaction within the context of academic development in higher education. For both designers and tutors, it is important to seek best practices for combining instructional strategies in face-to-face and computer-mediated environments that take advantage of the strengths of each and avoid inherent weaknesses. A qualitative case study of the lived experiences of 17 academic staff participants in a blended PBL module over a two year period was considered likely to provide a much-needed analysis of current thinking and practice on the potential of interaction in this form of higher education professional academic development. Specific aspects of interaction (technical, peer, content, and the learning experience) within blended PBL tutorials are analysed to provide research-based evidence on the realities of delivering a PBL programme using technology. The study reported in the chapter argues that the intersection of PBL and learning technologies can offer an innovative way of teaching and learning and is a reflection of pedagogy and technology as an integrated model that can work effectively together. The findings show that the synergy from the collaborative blended PBL approach in this module can result in the coherent and comprehensive provision of training, support, and research throughout higher education institutions.

INTRODUCTION

In higher education institutions (HEIs) in Ireland, as elsewhere, the use of online technologies has become an increasingly important challenge in academic staff development. As a field, blended learning has impacted on higher education in local, national and global contexts and is fast-changing, highly fragmented, but still rapidly growing. The Internet has made it impossible for HEIs to ignore

DOI: 10.4018/978-1-60566-880-2.ch001

technology in fulfilling their strategic mission and responding to the expectations of a diverse student body.

The promises of blended learning in the literature are extensive: increased learning, a reduction in the need for 'brick and mortar,' increased engagement, collaboration, and higher quality learning. However, there has been little examination or questioning of the interplay of new technologies and pedagogies in the context of higher education academic development. Transformative learning theory is being proposed in this study as a means to understand the complexities of education in an age where information and communication technologies (ICTs) are constantly reshaping and redefining our accepted notions of what it means to teach and learn in a HE environment. It is recognised that transformative learning is a complex process of interaction among people, the tools they use and the context in which they are embedded.

By analysing the blended problem-based learning (PBL) tutorial within a framework of transformative learning in professional academic development in higher education, the purpose of this chapter is to illuminate a complex situation so as to understand it better and therefore be enabled to facilitate beneficial change. Based upon extensive empirical research in higher education in recent years, Savin-Baden (2006) has concluded that the objective of combining PBL and e-learning is in itself complex.

There are two objectives of this case study:

- To establish, in a PBL tutorial setting, the factors that govern the success of blended PBL
- To identify technical, academic and interactional indicators of learning in the online and face-to-face PBL tutorial

This chapter argues for a much-needed analysis of current thinking and practice on the transformative potential of interaction in professional academic development in higher education; the chapter begins with an illumination on the background and context of the case study on the blended PBL module for academic development, with the associated literature review focusing on the fields of PBL, e-learning, and the convergence of the two. Special attention is given to the importance of interaction in the blended learning environment. Thereafter the case study is discussed and details provided on the research findings. Current challenges are outlined and conclusions drawn.

BACKGROUND

The role of blended learning within a pedagogical approach such as PBL has been gaining international recognition among practitioners and academic educators alike. Research into the concepts, tools, and methodologies of both e-learning and PBL has increased in momentum in recent years. However, contemporary commentators have voiced concerns with the speed at which technology has been proceeding at the expense of pedagogical advances. Within the specific field of blended learning, Jones (2006) has concluded that the practice of blended learning has outpaced the research owing, in part, to the rapid increase in both the quantity in use of and the sophistication of the technology.

Issues related to the design and implementation of blended learning environments have increasingly surfaced in recent years, as technological advances continue to blur the lines between distributed learning and traditional campus-based learning. This has raised questions about advances in technology during that last decade that have brought challenges and opportunities to the ways in which individuals are educated and trained, in particular through online instruction.

There is a qualitative difference between 'teaching online' and merely 'putting a course online'; a central feature of academic staff development involves conveying the difference between

using technology as a delivery mechanism and using it as a communications medium. The impetus for blended learning depends partly on a growing acceptance that higher educational and training programmes should be student-centred and partly on the need to develop enhanced efficiency in the provision of teaching.

This case study is taking cognisance of the need for strong and effective interaction between pedagogy and technology to ensure that both are used to best effect in implementing PBL in a blended learning environment. Gredler (2005) in his consideration of learning and instruction suggests that the role of technology in learning remains an issue for theory development and research. Specifically, there is a need for research on learning principles that address teacher-student interactions, student-to-student communication and student-to-subject-matter interactions for various uses of computer technology in blended environments. There seems to be much evidence in the literature that as blends of Internet-based teaching and learning have proliferated, researchers, theoreticians, and pedagogues have recognized that an educationally viable environment requires students to interact with content and with one another. The chapter explores all these core issues in depth.

THE RESEARCH CONTEXT

The focus of the research reported here is a Postgraduate Diploma module on designing e-learning for academic staff in an institution of higher education, which will be referred to as the Institute. Within the context of the Irish higher educational system, a module is a unit of study on a programme. The diploma programme is typical of many in HEIs today. In this context, the demand for institutions to put e-learning initiatives and the accompanying academic staff training and development firmly on their agendas has resulted in a number of emergent issues. For example, many academic staffs lack the online experience of the Internet generation, and so do not feel as confident in an online environment as they do in a traditional classroom setting. In this context, the problem is a social rather than a pedagogical one and lecturers may need to experience being online students themselves in order to gain the necessary confidence to move to facilitating an online environment. Putting staff training online can be one response to this problem, but making more efficient use of lecturer time is more often the reason why the online environment is used. Such moves can lead to a negative rather than a positive experience of the online environment, in some cases leading academic staff to believe that buying in to this growing phenomenon means subscribing to their own eventual redundancy. As increasingly it is also becoming important not just to make such training more accessible, but explicitly designed to produce qualitatively improved pedagogy (Ham & Davey, 2005, p. 263), it is important to ensure that the lecturer's first experience of an online environment is positive, one that will allow her or him to see the pedagogical possibilities at her or his disposal.

The institution in which the study took place is a large multi-campus, multi-discipline organization, with subjects offered within Applied Arts, Built Environment, Business, Engineering, Science, Tourism, and Food. The current and emerging higher education environment in the Institute, as elsewhere, is seeking solutions to problems of changing paradigms of learning and the influx of learning technologies. Skilbeck (2001) believes: "the essential test for such higher education institutions is their readiness to introduce policies and programmes to bring in and provide opportunity for 'new blood' as well as for the continuing development of the capabilities of existing staff for amongst others, mastery of the new technologies in both teaching and research" (p. 10). "Well-handled," he has concluded, "the opportunities of online education could improve

the relationships between staff and students and foster a better quality of learning" (p. 72).

This study presents the opportunity to work with eager members of the teaching community in offering a novel approach to their academic development. As all participants on the module are self-selecting and choose to pursue this professional development opportunity themselves, arguably it is a situated reality that participants are motivated and keen to explore the blended PBL approach offered through the module.

As it is important to incorporate capacity development in formal courses on higher education (Segrave, Holt, & Farmer, 2005), a postgraduate programme in higher education learning and teaching was developed in 2001, and has over 100 graduates today. The programme offered to academic staff still needs to be integrated with various levels and types of expert and peer practitioner support at faculty and institutional levels, provided through online and face-to-face encounters. In this way, translating their professional development experiences from the module into their own environments could become easier, allowing them to work effectively within a blended environment in the future.

The nature of these academic staff's varied work responsibilities today is complex, with demands on their time (ranging from lesson preparation, student support and research to staff meetings and curriculum development) pulling them in many directions. As a result of all the pressures academic staff face in today's higher education environment, Donnelly and O'Farrell (2006) have argued that for their own professional development they need to be provided with streamlined learning experiences which deliver essential topics and learning materials in readily accessible formats. It is believed a central challenge here is to create and sustain quality learning environments of enduring value for teachers.

The module used the WebCT course management system, which provided both asynchronous and synchronous interaction tools. For the former, the module had discussion forums where the participants posted their messages and its own email system that enabled the participants to exchange private emails. For synchronous communications, the module had 'chat rooms' where individuals exchanged instant messages at the same time.

Literature Review

There has been a consistent thread of research into the fields of e-learning and PBL in recent years and less in blended learning and online academic development. There has not been a focused study of the potential of blended PBL to transform the quality of the learning experience for academic staff in their own learning and their subsequent classroom practice. This current research represents the convergence of three major activities in higher education today: academic development; the blending of the technologies within e-learning; and the pedagogy of PBL. There have been many practice-based studies in each of these fields, but arguably each remains under-researched in its own right and engaging in critical debate in this converging research area is much needed. Generally, there have been unexamined actions and initiatives that have entrenched the issues of PBL and e-learning and made each more intractable and less open to reasoned debate. Some of the main issues for the former centre on content coverage and use of appropriate assessment. It can impose steep learning curves on both tutors and students, and initial tutor awkwardness and student hostility to the process are common. For the latter, the use of technology in education strongly depends on a variety of different factors such as staff training, consistent support, and funding.

Informally enthusiasm among academic staff for blended learning continues to grow and where explicit institutional policies are lacking pressure on lecturers to engage with new technologies is coming from students and from their own peers. Alongside this, new pedagogical approaches emerge on the educational scene to support

complex, flexible and integrated learning and the development of professional competencies. Although not new, PBL is one which appears to have captured the imagination and support of teachers; there has been a growing interest in the last few decades, particularly in the collaborative construction of knowledge through active learning and the importance of higher order skills such as problem solving. Given our increasingly networked society, interest has grown in such new educational methods and in where and when to teach them. PBL is an educational strategy that involves the presentation of significant, complex and real-world problems to students that are structured in such a way that there is not one specific correct answer or predetermined outcome.

The blended PBL module at the heart of this study itself strives to be both proactive and responsive to the changing needs of all academic staff from across the Institute, and other institutions of higher education in Ireland. By giving the participants the opportunity to be an online and a face-to-face PBL tutor using principles of good practice in PBL, this study provides evidence of the online PBL tutor role and whether it can be as effective as the tutor in the face-to-face PBL tutorial. Central to the delivery of the module has been critical academic discourse in tandem with the exploration of innovations in practice.

This study recognises that there is still confusion about the models, media and environments used to support PBL that use technology in some way, and is particularly concerned with illuminating current knowledge of PBL group-oriented interaction. Central to this aim is the need for a better system for delivering education and training for academic staff which Hameed et al. (2006) have recommended is paramount in the context of the move to a knowledge economy. Myers (2006) has made a case for such Internet-based courses being well suited for transformative pedagogy. He argues that online class discussions tend to be more collegial and informal than those that occur face-to-face, and thereby challenge conventional notions of power and authority in the higher education classroom. McAuliffe and Lovell (2000) also propose that such online discussions result in a relatively egalitarian environment and this is appropriate for teaching approaches that critically examine societal patterns of power and dominance.

Issues related to the design and implementation of blended learning environments have increasingly surfaced in recent years, as technological advances continue to blur the lines between distributed learning and traditional campus-based learning. This has raised questions about advances in technology during that last decade that have brought challenges and opportunities to the ways in which individuals are educated and trained, in particular through online instruction. McConnell (2006) suggests that a major motivating factor in the uptake of e-learning in organisations is "the professional development of trainers, course developers and teachers in the new form of learning provision" (p. 25). This echoes the sentiments of other researchers in the field (Segrave et al., 2005), and forms the core of many institutions' e-learning strategies.

In addition to technological challenges for teachers and academic developers, there are issues that arise during the change process from a traditional delivery mechanism, such as the lecture, to a problem-based educational model. Kolmos (2002) has reported that, in spite of an extensive staff development programme to introduce teachers to the new PBL model, the change in the nature of teaching caused problems with retention and curriculum. She urged academic developers to be aware of the need to facilitate the change at individual, culture and organisational levels, which is a comprehensive challenge in itself.

McDonald and McAteer (2003) believe blended learning, a blend of on-campus and external education facilitated by technology, has emerged in response to the global and educational changes experienced by HEIs mentioned earlier. Arguably it has also emerged as an alternative to fully online

programmes. As a result, research continually calls for an emphasis on pedagogy to drive the design of blended courses today. Most recently, Reinmann et al. (2007) in providing evidence from qualitative studies of blended learning in practical situations, including PBL in higher education, draws on tutors' and students' perspectives to argue that the introduction of blended learning requires clear decisions to be made on a number of key areas; these include the distribution of learning content, didactical approaches, ways of communicating and characteristics of learning environments.

Certainly, if one text-byte can capture a trend such as blended learning, then perhaps it is the well known one by Rosenberg (2001): "the question is not if we should blend…rather the question is what are the ingredients" (p. 86). Bonk and Graham (2006) agree that the term blended learning is being used with increasing frequency in academic conferences and publications in higher education and, based on their global research perspective, the use of blended learning now seems to be omnipresent across Asia, Australia, Europe, the Middle East, and the United States. The comprehensive case studies included in their research would certainly signify this. In the midst of the current wave of enthusiasm for blended learning in higher education, consciousness should be raised about the criticism in recent years about blended learning environments that fail to create effective settings for learning. Informed by such studies as Noble (2001) and Oliver and Herrington (2003), I am aware of the ubiquitous debate about the ongoing relationship between pedagogy and technology. This study is taking cognisance of the need for strong and effective interaction between pedagogy and technology to ensure that both are used to best effect in implementing PBL in a virtual environment.

In parallel with these developments, one of the pivotal debates in higher education in the last few decades has centred on what has become known as a paradigm shift towards student-centred learning. The impetus for blended learning depends partly on a growing acceptance that higher educational and training programmes should be student-centred and partly on the need to develop enhanced efficiency in the provision of teaching. Although these two forces can work in opposite directions, it is important to acknowledge what these shifts can imply in practice. McDonald and Mayes (2005) believe that in the concept of blended learning we see a measured approach to the delivery of education and acknowledge that learning technology has a role in achieving a student-centred approach. However, there remains a paucity of research on blended learning from HEIs in the United Kingdom and it is argued here that a similar situation exists in the Republic of Ireland, although in an Irish higher education context O'Donnell and Garavan (2003) have reported there is "positive recognition for the benefits of blended learning" (p. 11).

Sloman (2001) has highlighted that it has widely been accepted for some time that technology has the potential to enhance and transform the traditional learning experience, for students and teachers alike. Gurrie (2003) has argued that although very little research has been conducted to determine the effectiveness of PBL in the online environment, she believes it embraces many of the concepts that have been identified as best practices in online teaching and learning. There appears to be a lack of comprehensive analysis of the activity and practices of blended PBL in academic development to have taken place.

Within this, a number of outstanding issues remain to be addressed, including the nature of questioning, the character of informative feedback, the scheduling of reinforcements and the structuring of information for students. There is a pressing need to address these gaps within the use of blended PBL if academic development is going to include it as a widely accepted practice. It has been found that previous studies in the area of blended PBL have not prompted sufficiently diligent inquiry and serious debate. McShane (2006) has called for further research into academics' perceptions

of what it is to teach in a student-centred manner in a blended environment. Similarly, Lycke et al. (2002) advocate in their ongoing project on PBL and ICTs in Norwegian higher education that up-close studies are needed to answer vital questions such as how academic teachers can promote effective e-learning strategies among their students. Panda and Juwah (2006) note that the increased use of the Web for learning and teaching has "necessitated a re-examination of some of the issues with e-learning and the professional development of academic staff engaged in an online facilitation role" (p. 207).

Masie (2006) contends that blended learning has always been a major part of the landscape of training, learning and instruction; however, in reality it has only become a noticeable feature of the higher education sector in the Republic of Ireland since the beginning of this new millennium. There has been a community of practitioners studying and working in blended courses for many years; nevertheless research in the main has been inadequate. This places this current study on the continuum for revision and rejuvenation of the field of research into blended learning and a starting point for the exploration of blended PBL as a model of academic development. The study aspires to be a source of information, stimulation, and encouragement for those academics who have not fully understood or accepted the concept of blended PBL and is an attempt to capture the participant experience of learning using a blended PBL approach to their academic development in higher education and their subsequent exploration of transformation in classroom practice.

Interaction in Blended PBL

The research surrounding this module is based on the notion that interaction among participants in the PBL group is the key element of a successful blended learning experience for all involved. This is based on a sociological understanding of one of the dimensions of interaction for describing groups, coined by Wagner (2006) as interactions as transactions.

Interaction has been and continues to be one of the most hotly debated constructs in the realms of distance and e-learning, instructional design and academic transformation, to name but three. The ability to interact—with tutors, students, content interfaces, features, code, channels and environments—can be argued to be analogous to being connected. Whilst this may appear simplistic, for technology-mediated learning interaction is undoubtedly a key value proposition. It continues to be perceived as the defining attribute of quality and value in a blended learning experience. Interactivity is the core of learning, and is evident at all levels of engagement. However, the term *interactivity* is used so loosely that in the fields of e-learning and blended learning it has become almost synonymous with the notion of learning itself. This chapter proposes that, by bringing the concept into sharper focus, real insight is gained into the nature of blended PBL. Interaction in the context of this study is explored at three levels: interaction with concepts, tasks, and people (peer learners and tutors).

CASE DESCRIPTION

Interpretivism was the paradigm for this study. Interpretivism seeks to understand the complex world of lived experience from the perspectives of the participants. It draws on a broad combination from the history of ideas, which includes hermeneutics, critiques of scientism and positivism, practical philosophy and discourse analysis, and asserts that we can understand the world only by interpreting it, as reality is subjective rather than objective. Within the spectrum of interpretivism, this study was situated in a position that interprets the participants' discussions in the blended PBL tutorials as both constitutive of the world and constituted by the world. Mertens (2005) gives an elaboration of its philosophical core and points out

that the interpretive and constructivist paradigm emphasises that research is a product of the values of the researcher and cannot be independent of them. However, Cohen et al. (2000) highlight that there is a risk in interpretive approaches: that "they become hermetically sealed from the world outside the participants' theatre of activity—they put artificial boundaries around subjects' behaviour" (p. 27). Recognising that there is an interpretative, subjective aspect to the qualitative data gathered in this study; therefore, I took appropriate steps to preserve data quality, namely triangulation—cross checking data collected using different sources of information; peer consultation; and maintaining accurate up-to-date data records to assist in the establishment of a chain of evidence (Merriam, 1998).

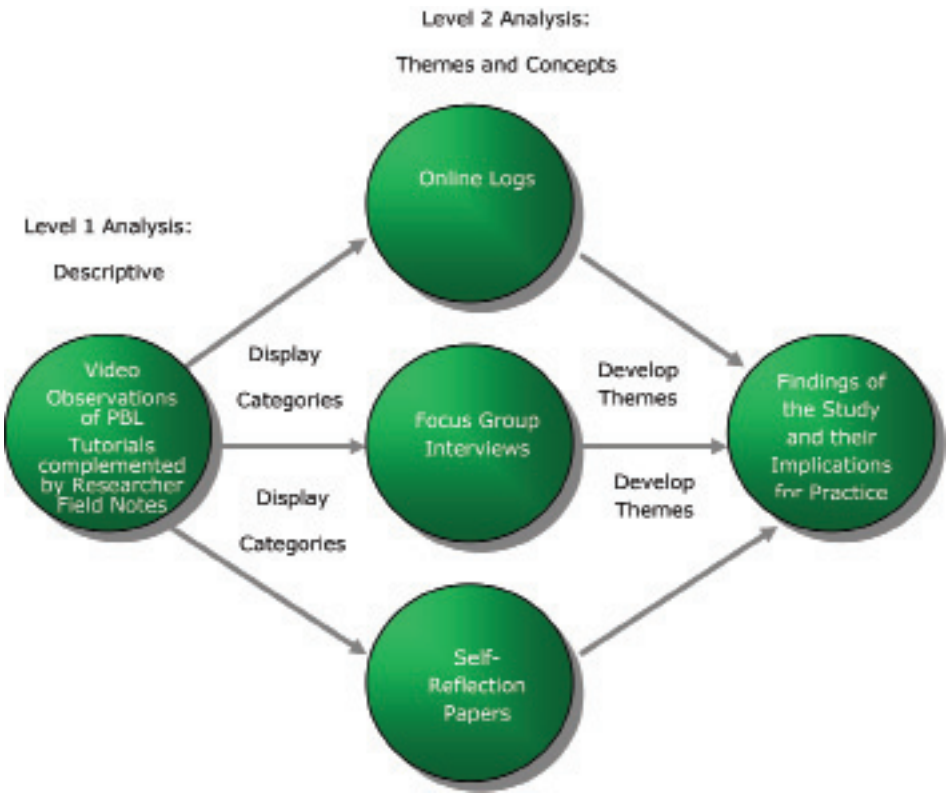
The interpretivist emphasis on meaning and the relationship between language and meaning are addressed in the concept of discourse, which in this study is a Web of statements, categories, beliefs and practices. The aim of this approach was to explore the research objectives in ways that made connections among the words from the videos and online discussion forum transcripts, the social functions these words perform and wider social practices. Interpretivism was chosen to identify the essence of human experiences concerning the phenomenon of blended PBL as a model of academic development, as described by the 17 participants in this study. It involved this small number of participants in extensive and prolonged engagement designed to provide a basis on which to understand their lived experiences and develop what Creswell (1998) calls patterns and relationships of meaning. Consequently, the motivation of this research was to gain a rich insight into the PBL nature of the blended environment rather than focus on the statistical analysis of quantitative responses by participants.

In research that is very pertinent to this study, in an exploration of the theoretical debate about Mezirow's transformative learning, Taylor (1997) has called for designs of research which included other methods beyond interview, such as observations and content analysis in an ongoing educational context. For this study, the analysis of written transcripts, which have been created by the participants during computer conferencing, invariably takes the form of a systematic content analysis. Donnelly et al. (2007) believe whether the analysis is used quantitatively or qualitatively, there is much to commend this type of approach by higher education tutors wishing to assess the progress of their students and further their understanding of how students learn through computer conferencing technology.

The general research design was to observe the process of learning on the module in some depth. In order to ensure that sufficient observational data had been collected for a thorough analysis of what was occurring in the module; three complementary methods were chosen to provide the data relating to the experiences of the participants, in addition to my more obvious tutor role in the module delivery. Collating computer mediated conferencing (CMC) transcripts of online discussions were used to capture what was happening in the online component of the blended PBL tutorial, and textual analysis of participants' reflective papers was used to explore transformations in learning and focus group interviews to augment the observational data. The research methods employed to collect face-to-face and online observational data from the module itself were participant observation, online discussion logs, open-ended focus group interview and self-reflective papers to capture the participant's own thoughts and experiences of the blended PBL approach. Each method was chosen for the opportunity it could offer to explore interactions and dimensions of transformation, both of which were central to this study.

Figure 1 illustrates how the research methods fitted together and have allowed me to gain deep insights into how interaction happens in a blended environment within each of the groups. The approach taken to the collection of data about the blended PBL groups was multi-faceted. A major

Figure 1. Integration of data collection methods



concern has been to provide meaningful and accessible insights into the practice of blended PBL based on the analysis of real life situations. There were two levels taken to the analysis of the data. Level One was descriptive in nature and through video observations explored the interactions among the peers, the tutors and the content of the blended PBL tutorial. Level Two was a thematic analysis of transformative learning in blended PBL and, through a combination of online logs, focus group interviews, and participant self-reflective papers, categories and themes emerged to inform the findings of the study and implications for practice. Being engaged with the events as they happened in the field and attempting to bring holistic attention to the practices as constitutive of a distinct culture were important to this study. As suggested by Hine (2000, p. 20), this study has examined those enduring practices through which the blended PBL groups have become meaningful and perceptible to participants.

Data collection took place over two years in this study, as the intention was to study more than one PBL group, and this was achieved with three groups in total. The activities of three blended PBL groups, two of which were working at the same time but separately in the 2004-05 operation of the module, and one in the 2005-06 academic year were the observed focus of the study. The intention was to carry out a detailed study of the work of each group for an extended period of time (typically ten weeks) and produce an interpretation of their academic discourse through close examination of their activities. The PBL tutorial observations for each group were transcribed. The face-to-face classroom and online observation was complemented by two focus group interviews for all three groups. It was important to observe

the groups over the complete ten week period of the module in order to examine how the groups negotiated the problem face-to-face and online, how the group dynamics worked in the blended environment, how the life of the group unfolded thereafter and what influenced the participants in reaching a transformation in their learning.

The four methods of collecting data for this study (participant observation, collation of asynchronous online discussions of the PBL groups, focus group interviews, and textual analysis of participants' reflective papers) were continuously complemented by prolonged immersion in the literatures of the field. The sample for this study was the total population (17 participants) of blended PBL groups undertaking the PBL module in the two years that the data were collected in order to explore the lived experience of a heterogeneous population of academic staff in higher education; there were three PBL groups in this study.

I now discuss the ethical and power issues involved in the process of reasonably informed consent. There are numerous sources of advice about preparations prior to embarking on fieldwork (Davies, 1999), involving the more general injunctions about intellectual preparation through familiarizing oneself with literature about the area. A number of steps were undertaken in the preparation for observation in the study. Firstly, it was necessary to arrange access and this involved the module participants, guest tutors, the Head of School and colleagues in the centre in which the module is located. A formal ethics statement and statement of informed consent were prepared and distributed to module participants and guest tutors. It concerned areas such as selecting participants, types of questions asked, agreement of participants to be involved, storage of data from the research, anonymity (pseudonyms were used throughout the study to protect the identity of the participants) and disclosure of results to participants. Inherent in this was the need for persons to review drafts to validate observations and descriptions. The video cameras were prepared and the online discussion software recording capabilities were checked. I then drew up a schedule of the observations, and developed a standardised procedure for how the observation would run. Finally, as part of the initial preparation, I evolved a record-keeping system involving the videotapes, and a coding system.

A further challenge concerned the notion of addressivity of 'compliant talk' by the participants in the study. Due to the dual role in the relationship between the researcher as tutor and the academic staff who were learners on the module and participants in the study, it is acknowledged that the possibility that the participants may have said what they thought you wanted to them to could be considered a limitation. However by building triangulation into the research process this possibility was lessened.

Discussion of Findings

This section of the chapter concentrates on the findings from the content analysis of the CMC discussions. With the participants' permission, the discussion space software was also employed to capture their contributions as text files and as prints of the discussion site pages. In addition to the text entered by the participants and tutors, the files include automatic time and date stamping and an indication of the source of each message.

The content of messages and the extent to which they formed patterns of interaction between peers, tutors and content of the blended PBL module were analysed. In the literature, typically analysis of CMC is at a number of different levels including the frequency and patterns of interaction, categorization of messages and thematic analysis to allow a much more detailed interactional analysis and message content. Individually, none of these allow analysis of how online collaborative learning takes place in PBL but a combination of detailed interaction plus content was very helpful in this study. Bosley and Young (2006) have suggested that ethical concerns may be among the reasons that group discussions are more commonly analy-

sed than one-to-one exchanges. There was the opportunity to access the data in these postings as messages sent through WebCT on the module were stored and retrievable.

In order to analyse the dimensions of the learning process in the asynchronous data transcripts, a number of CMC analytical frameworks were considered for this study (Donnelly et al., 2007). The conferencing contributions were analysed quantitatively (the number of messages per participant and tutor to investigate the patterns of interaction) and qualitatively (content of the messages were scrutinized to investigate the extent that participants were forming, critiquing and communicating ideas online) in this study. The paper transcripts were examined and each post was free coded to generate categories. These were then refined and divided into components that signified their use was to do with building of community (that is, social) or cognitive (that is exploring content issues relevant to the module and the PBL problem).

An early issue was to decide on the most appropriate and fruitful unit of analysis. Units of meaning were categorized into common themes and a list of codes devised to represent the emerging categories. Categories were modified, developed and regrouped as analysis proceeded. New categories emerged and some early ones dropped. The final categories derived are given in Table 1:

Table 1. Categories used for thematic content analysis of cmc discussions

Code	Category
SE	Posting is to share prior experience
SR	Posting is to share references and resources
PF	Includes positive peer feedback in response
C	Provides/seeks clarification
FI	Forms a new idea
CR	Critiques peer response (expresses reservations/ disagrees with another contribution)
GT	Interaction with the international guest tutors
M	Miscellaneous
U	Unrequited messages from peers

These categories were not exclusive and together they provided some evidence about the extent to which the contributions answered one of the research objectives of this study. Clearly the small numbers in this study do not support comparisons between the different corpuses of data in the field and it is not my intention to make such comparisons.

The WebCT course management system automatically numbers, in a threaded manner, the postings of the module according to the time a text was posted and placed on the discussion forum. All the postings on the discussion forums were not modifiable by the participants and thus, all the postings remained in their originally posted forms. While the WebCT system technically organized the online environment of the PBL groups, actual interactions took place through the actions and reactions of the participants to the PBL learning setting, module materials and activities, to tutor and guest tutor directions and to peers' ideas and actions.

There were eight enumerations collated from this data and all were taken at week 10 of the module to explore the individual participant's activity in the discussion boards and the PBL group work patterns in the online environment, so that some comparisons could be made to face-to-face (f2f) activity. Table 2 shows these findings for each participant in the study:

- Revealing levels of online activity for each individual participant required collation of the frequency of contributions of each participant to the online PBL group discussion forum;
- Exploring the development of substantive discussion amongst all the participants in each of the three PBL groups needed the average messages per thread;

Table 2. Breakdown of statistics for online participation of each participant

Participant	Frequency of Contributions	Average Messages per Thread	Amount of Time Online [per week]	Average Time Online [whole module]	Postings Repeated	Number of Messages Read	Number of threads per PBL Group	Number of Attachments per Participant
Ronan	73 postings	/38 = 1.92	3.5 hours	35 hours	-	245 (All)	38	31
Padraig	30 postings	/38 = 0.78	3.5 hours	35 hours	-	211	38	16
Aidan	45 postings	/38 = 1.18	3 hours	30 hours	1	202	38	26
Loirin	48 postings	/38 = 1.26	6 hours	60 hours	-	194	38	21
Aine	49 postings	/38 = 1.28	5 hours	50 hours	1	223	38	30
Niamh	47 postings	/46 = 1.02	5 hours	50 hours	1	206	46	22
Eimear	46 postings	/46 = 1	2 hours	20 hours	2	190	46	24
Sorcha	59 postings	/46 = 1.28	5 hours	50 hours	1	231 (All)	46	26
Caitlin	38 postings	/46 = 0.82	1.5 hours	15 hours	1	210	46	26
Dervla	41 postings	/46 = 0.89	2 hours	20 hours	2	198	46	23
Declan	98 postings	/55 = 1.78	4 hours	40 hours	-	365 (All)	55	14
Michael	37 postings	/55 = 0.67	2.5 hours	25 hours	-	327	55	22
Darragh	33 postings	/55 = 0.6	3 hours	30 hours	-	312	55	17
Myra	89 postings	/55 = 1.61	3.5 hours	35 hours	-	365 (All)	55	37
Caolan	32 postings	/55 = 0.58	2.5 hours	25 hours	-	304	55	13
Maeve	40 postings	/55 = 0.72	3 hours	30 hours	-	297	55	15
Ryan	36 postings	/55 = 0.65	1.5 hours	15 hours	-	284	55	11

- Comparing the f2f and online contact in the blended PBL tutorials required the amount of time each participant spent online;
- Enabling comparison with f2f activity in the PBL tutorial, the average time spent online per week for each participant was needed;
- Repeated postings (queries and requests for help) was collated; a low number would indicate how comprehensively the peers were responding to each other in their groups and possibly ability in searching through messages and reading them for key words and phrases;
- Revealing individual levels of online passive participation required the collation of the number of messages read only by individual students;
- Showing the number of different conversations happening online required the collation of the number of threads created per PBL group; and
- Demonstrating evidence of reflection by returning to the discussion forum with work on the PBL Problem necessitated the collation of the number of attachments of learning material to postings per participant.

There was an average of 49 postings made by each participant over the ten weeks of the module. Column 3 showing the average messages per thread for all the participants in each of the three PBL groups and it indicates little development of substantive discussion with an average of 1 message posted per thread. However, Column 9 shows an average of 22 attachments of documentation

on the PBL Problem made to a posting by each participant.

Blended Community and Cognitive Development

Results from a recent study by Dawson (2006) on online forum discussions reported that mere quantity of discussion postings is not an indicator of community development; a significant relationship is observed when contributions are codified into various discussion interaction types (learner-learner; learner-content). Earlier research by Harasim (1987) also endorsed the categorisation of forum interactions and suggested that these types of interactions were the most important for enhancing the learning process. Similarly, in this study, the online discussion forums provided the participants with an opportunity to enhance community building in their PBL group and extend the collaborative dialogue from the face-to-face PBL tutorials. Postings from the discussion boards from all three PBL groups are included below whereby the participants were working towards the building of community within their group both online and face-to-face.

Positive Peer Acknowledgment of Work

Message no. 779[Branch from no. 778]

Posted by **Sorcha** *on Monday, December 20, 2004 1:39pm*

Subject: Re: Philosophy statement

Hi Dervla, you are doing absolutely Trojan work and putting the rest of us to shame. I couldn't face any of it until yesterday and all your messages were making me feel very guilty! Thanks for starting the work on the learning outcomes as it will be very helpful to myself and Niamh who have been allocated this task.

Message no. 1711[Branch from no. 1704]

Posted by Ryan on Sunday, March 19, 2006 10:06am

Subject: Re: Many happy returns

Hi Myra and everyone,

Excellent summary - you are a hard act for me to follow as Chair next week.

Asking for technical help

Posted by **Eimear** *on Thursday, December 16, 2004 10:19am*

Subject: Ground Rules

Help anyone? How can I create a new thread??? I know we covered it before in class but it eludes me this morning.

Peers Expressing Concerns: Overwhelmed, Chaos, Information Overload

Message no. 694[Branch from no. 675]

Posted by **Niamh** *on Friday, December 10, 2004 6:34pm*

Subject: Re: re group task

Hi Sorcha, Thanks for this. I agree re the allocation of tasks. Like Eimear, I do feel adrift but I am confident that after a lengthier discussion on

Tuesday in class we will have a greater idea about where we are going. We haven't really had an opportunity to do that yet.

Message no. 684[Branch from no. 673]

Posted by **Padraig** *on Thursday, December 9, 2004 9:52pm*

Subject: Re: Group name

I am coming late into this discussion and feel like a real "Dumbledore". I can vouch for one thing since I came late to the f2f tutorial on Tuesday - now I feel I have missed a lot of info and direction. However, moving from my student to my teacher hat - it's a useful lesson for me but also to be aware of it in designing online learning in the future.

Similarly, the evolving of a cognitive dimension to their work in PBL can be illustrated from the data and examples are set out below.

Sharing Work Completed on Individual Task (Updating on Progress, Including Asking for a Critique of Work, and Debating Subject Issues)

Message no. 1778

Posted by **Ryan** *on Monday, March 27, 2006 11:24pm*

Subject: Final Group Report

Hi Everybody,

Please find attached Myra's version posted on the 27th at 9.00pm after Declan's and Michael's excellent tidy up job but with all the colours removed and every thing in black type. Declan, I hope you don't mind but I thought the Evaluation piece was a bit weak and I was not sure if you would get any time to add more, so I wrote a little just in case. Essentially I feel we need to show cognizance of several models of evaluation and also include a theoretical basis for why we are doing so. Then we should link this to the philosophical rationale for our course and the instructional design model we have adapted. Please feel free to come in on this – a critical friend would be great just about now on this part of the report!

Myra, just an idea - rather than you being left to write up the conclusion by yourself, should all members of the group contribute a reflective piece of writing? We could use some of the material from our reflective journals or from the reflective thoughts we wrote during our or just after our live online chats? Maybe everyone in the group might use this thread and respond yes or no. Maybe we can discuss this further when we meet at 9 on Thursday.

Peers Sharing Resources

Message no. 765

Posted by **Caitlin** *on Friday, December 17, 2004 3:14pm*

Subject: Useful Journal Articles

I have attached an article I found on the British Education Index which I thought was quite interesting and which you might like to read. It is entitled 'When learners learn on-line, what does the facilitator do?', so it is directly relevant to what we are doing. If I come across anything else I will post it up under this thread.

Peers Sharing Experiences

Message no. 785[Branch from no. 748]

Posted by **Ronan** *on Monday, December 20, 2004 8:27pm*

Subject: Re: Student survey

I get phone calls almost every week from students or their parents asking for tuition for those who have failed previous exams with math being their major difficulty. My line manager has asked me on numerous occasions to assist students also.

I have spoken to several colleagues in recent weeks who all believe there is a need for extra tuition for weak students and am supportive of the concept of an online module.

At the moment the evidence is anecdotal and based on opinion but it is the opinion of experienced educators so should we go with this at the moment and elaborate on the needs for our final report.

Peers Taking the Lead on the Problem, Providing Clarification and Encouragement to Each Other, Forming New Ideas, Updating a Peer on Missed Work

Message no. 710[Branch from no. 708]

Posted by **Loirin** *on Saturday, December 11, 2004 9:36pm*

Subject: Re: re group task

Hi Aine,

Nice to see someone else online with me on a Saturday night! Am missing Strictly Come Dancing at the mo! Getting my priorities straight! I know you missed the synchronous chat yesterday so you may feel a little out of the loop at the moment.

We need a decision emanating from our group on this issue; but don't worry - there will be plenty of time on Tuesday morning when we all meet in the class to reorient ourselves as to the best way forward. I feel this is the important time now when as a group, we are all happy with the decision taken so we can work together on aspects that particularly interest us. It will all come together in the next couple of weeks, I'm sure.

PBL Content Interaction with Guest Tutors

Message no. 1413[Branch from no. 1347]

Posted by **Myra** *on Wednesday, February 15, 2006 7:17am*

Subject: Personal greetings

Hi all,

We now seem to understand the importance of having this kind of non-formal discussion or messages. Some of us told you about visits in Finland, and Scandinavia and I have been thinking a lot of my visit too. I think it's really interesting to explore why we do this? I understand it is a reflective (or not conscious) process of trying to understand the other's background and culture. And if we are trying to reach a real dialogue, we need common ground and shared understanding.

I think we need to keep this up as language is a tool which we use to reproduce the reality.

Linking to F2F Tutorial Directly (Blended Approach)

Message no. 1357[Branch from no. 1356]

Posted by Ryan on Saturday, February 11, 2006 12:33am

Subject: Re: Tuesday's forthcoming f2f class

Hi all,

Well done Michael on your summary. I will reply to your experience another thread.

Things to do for class next week:

• Answers to library questions

• Declan will be the Chair.

• Tuesday 21st: dry run for the guest tutor video conference - 9am.

• Questions for the guest tutor this week: thread set up in Cyber club 7

Other notes:

• Divide up Webliography between us, and report on what we find.

• Task 3 Home work: to be carried out over two weeks.

• Note the Sunday night dead line!

Table 3 shows the breakdown of the community and cognitive aspects of the online discussions for each of the three PBL groups. The essential elements of PBL learning conversations were provided though the sharing of multiple perspectives on experience and research, complemented by a range of individual disseminated research amongst the groups. PBL Group 1, self-titled CPD challengers are in blue; PBL Group 2, self-titled The Apprentices are in orange; PBL Group 3, self-titled Cyber Club Seven are in pink.

The use of direct quotations is now used to provide evidence of both the shared enthusiasm for the blended PBL process and some real concerns voiced by the participants. Whenever possible by using the words of the participants themselves, key issues have been highlighted.

Table 3. Community and cognitive online posts for three PBL groups

Community Categories	Postings	Cognitive Categories	Postings
Positive peer acknowledgment of work	10 20 37	Sharing work completed on individual task (updating on progress, including asking for a critique of work, and debating subject issues)	16 69 31
Asking for technical help	9 (mainly in early weeks) 5 (mainly in early weeks) 5 postings and 9 peer responses helping out	Peers sharing resources	13 12 12
Peers expressing concerns: overwhelmed, chaos, information overload	5 (present in first 3-4 weeks only) 1 2	Peers sharing experiences	5 2 4
Peers simply announcing online presence	4 2 7	Peers taking the lead on the problem, responding to peers on technical problems, summarizing and weaving themselves, providing clarification and encouragement to each other, forming new ideas, updating a peer on missed work	7 32 49
Peer unrequited messages	2 0 4	PBL Content Interaction with Guest Tutors	19 44 61
Miscellaneous (Humorous)	5 5 5	Linking to f2f tutorial directly (blended approach)	3 3 6

For inclusion of all participant quotes, the following applies:FG = Focus Group Interview (either indicated by 1 or 2 for the first or second interview)RP = Reflective Paper (numbered 1-17 for each participant)

Commonalities existed between all three blended PBL groups in the online discussion forums:

- The most prolonged interactions over all three groups were with the guest tutor discussions (Column 4, Row 5);
- Resource sharing and diffusion of experiences dominated the first 4-5 weeks of online interactions over all three groups (Column 4, Rows 2 and 3);
- Posting individual tasks and updating peers on progress dominated the use of the threaded discussions (all had attachments of work) conducted outside of face-to-face tutorials in the last 5 weeks of the module (Column 4, Row 1);
- In 2 groups, there was evidence of peers taking over the tutor's online role (Column 4, Row 4);
- All groups had members who felt the need to acknowledge their online presence without contributing to the discussion (Column 2, Row 4); and
- There were low levels of unrequited postings in all groups (Column 2, Row 5); throughout the life of these groups, it was evident that members did reply to requests and questions from other members. In the few instances where there was no response to these, the second focus group interview with 'Cyber Club Seven' offers a reason.

I think there is a certain amount of maturity needed online and you have to be in touch with your own feelings so you can relate to others. If you put up something and hope for a response from others because you think it is very important and none comes, you can't take it personally as people may have been too busy. (Ryan, FG2)

If there were no postings by participants in a PBL group, it was perceived as their absence by their peers. There was a strong sense across all three groups that by making postings, participants were embodying their presence in the group and after an absence of more than a few days, some felt it necessary to post just to proclaim their online presence; reading others' postings without this proclamation was not considered good enough by some. Reasons provided by participants about some in the group not valuing online participation as much as face-to-face and not understanding the mechanics of online communication moves into the realm of lurking, but beyond the two-pronged argument explaining such passive participation, we must be aware of the lack of knowledge that we really have about their behaviour.

I mean I was in WebCT all the time and I didn't always feel the need to contribute a posting. For me it was like people were making comments just for the sake of it and there wasn't really anything to say sometimes. What I was doing in that time was reading a lot and then I was better equipped to contribute to the discussions afterwards. (Sorcha, FG2)

I don't like posting messages up until I have something to say. When I did log on and unless I said - hello, it's me, there was resentment there. I actually felt quite vetted because my name was not up there as much as everyone else's. And why am I feeling guilty about this, and I think it is simply because your name is not up there, and the others are, having more of an online presence - whatever that means. So I thought; am I contributing in class? Yes I am, and I am doing my work? – so what am I doing wrong? And there was this whole onus of guilt surrounding posting that I didn't like. (Caitlin, FG2)

The postings became the only clues that the person was present and were made with a certain goal, i.e. to inform the other participants of Caitlin's and Sorcha's potential inactivity or invisibility. The other two groups did not experience this:

I think it was so important that we all felt comfortable if you didn't have something to say, you didn't have to. (Loirin, FG2, 'The Apprentices')

The main thing is that our group members came in online at all times, and could say, I just don't know what I am doing this week; and you felt able to say that. (Maeve, FG2, 'Cyber Club Seven')

The cognitive dimension of learning involved the contribution of knowledge and experience and the community dimension involved a balance of support and guidance with the creation of a pleasant learning environment. Both cognitive and community or social congruence is necessary for effective group functioning. For all three groups, at the close of the ten week period, the cognitive postings were significantly higher than the community postings. This is akin to the cognitive apprenticeship models of learning, where learning is scaffolded by both peers and experts. When one looks at the relationship between the participant contributions and the sense of community in the group, findings from all three groups indicated that a significant relationship exists between the quantity of peer-to-peer contributions and the participant reported sense of community in the group. The group composition appeared to contribute towards the cohesion within.

We had a very supportive group, almost all of us from the Apprentice trades background. I thought it really interesting from reading through these categories and examples from the data that the group who was having a less than positive experience were the ones who had the least amount of postings. In other words if you participate at a certain level you are more likely to get something out of it. Perhaps if you participate at a minimal level you are not as likely to. (Ronan, Participant Verification Session, 08/02/07)

CURRENT CHALLENGES

This study was an attempt to provide insights into blended PBL in a higher education academic development context in order to encourage in-depth discussion and open debate on the field. While there is much growing interest in blended PBL in practice, if this interest is not married to current research and knowledge in the field it can be argued that it will be of little, if any, transformative value for higher education. At this point, it is important to acknowledge the obstacles to, and the limitations on, the enactment of transformative learning in this case of learning environment. It is acknowledged that there are hazards in entering the choppy waters of intellectual debate on transformational learning. Transformative learning in blended PBL takes place when students elaborate old or learn new frames of reference as well as transform old or learn new habits of mind. However transformative learning is a complex process of interaction between people, the tools they use and the context in which they are embedded.

It is contended that there is a need to focus on interactivity within blended PBL and its critical application. The blended format coalesces Web-based and face-to-face instruction into an entirely new model that holds potential to transform both learning and teaching in higher education. However, the improvement of educational practice is notoriously difficult, especially when the goal is to foster transformation in thinking and practice. Tyack and Cuban (1995) have argued that pockets of effective teaching exist but they seldom last long or spread beyond a few dedicated pioneers. Clarifying the principles of effective problem-based and e-learning pedagogies and sustaining the means to support its enactment in a wide range of departments and institutions constitute an abiding challenge of professional development for teachers.

To meet the demands facing academic staff today, teachers need professional development opportunities that support them in a transformational process and in a sustained way. Such transformation of curriculum and pedagogy is a complex process for teachers; it is the findings of this dissertation that blending PBL and new technologies appears to hold promise in overcoming the traditional limitations of professional development which in this Institute and elsewhere in Ireland have tended to be short-term workshops, focused on general topics rather than deep knowledge of subject matter and pedagogy, disconnected from specific classroom practices and isolated from ongoing support from colleagues and tutors.

Systematic, comprehensive staff development is a crucial requirement of the contemporary learning organization and there are many different ways of providing for it other than conventional short courses. Learning that involves the analysis of complex problems and issues, and more complex higher order learning generally, are not amenable to this form of packaged e-learning. Something more dynamic that addresses the complexity and messiness of real life is needed.

The issue of transferability of innovative approaches and developing the capacity to respond to innovation and change remains a key area for further research. Whilst this may appear to be an unpalatable position to take at times, realisation is required that for real and not just cosmetic change to take place a whole range of well-established cultural tools needs to be re-created to transform

the way that academic staff experience their professional development.

CONCLUSION

A qualitative study of the lived experiences of 17 participants in a blended PBL module provided findings on specific aspects of interaction (technical, peers, content and the learning experience) within blended PBL tutorials which have not previously been analysed within a framework of transformative learning. It is acknowledged that there are hazards in entering the choppy waters of intellectual debate on transformational learning. Mezirow (1990) has pointed out that all learning is change but not all change is transformation.

The main findings of the analysis of the data indicated that for all three groups, at the close of the ten week module, the cognitive postings were significantly higher than the community postings. However, the technology also acted as an activating event for transformation in that the online discussion forums provided the participants with an opportunity to enhance community building in their PBL group and extend the collaborative dialogue from the face-to-face PBL tutorials.

The nature of the blend involved distinguishing what worked best in the face-to-face and online environments. It was important to utilize time spent online for organising work for the face-to-face tutorial and as a source of positive peer feedback. Conversely, the face-to-face tutorial was useful for clarifying any misunderstandings which took place online. Ultimately, there is no single mode of transformative learning that exists; differences in learning contexts, learners, and teachers all affect the experiences of transformative learning.

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