

# Incorporation of web-based applications and online resources in undergraduate medical education in the Irish Republic. Can new changes be incorporated in the current medical curriculum?

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## Abstract

**Background/Aim:** Significant change has been happening in the introduction of technology in medical teaching all over the world. We aim to determine if the undergraduate medical students and teachers are open to incorporating changes in the current medical curriculum or if there is a need for the same in the Republic of Ireland. **Materials and Methods:** A cross-sectional study involving 202 participants of whom 152 were medical students and 50 medical professionals (teachers and hospital doctors) were carried out involving three different medical universities namely; University College Cork (UCC), University College Dublin (UCD), and National University of Ireland in Galway (NUIG). Participants were requested to answer a series of 15 questions designed incorporating various fields of technology necessary for the study. The data was collected and analyzed using Statistical Package for Social Sciences (SPSS) software to determine statistical significance. **Results:** The participants overall had a positive attitude toward the utility of modern technology and web-based applications in current medical curriculum. Ninety-one percent of the participants preferred the introduction of modern technology into medical education and 7% were against the idea and a further 2% of them remained undecided. **Conclusion:** There seems to be a “technology gap” in the current undergraduate medical curriculum in Ireland. A large-scale study involving more participants from all the medical schools in Ireland is recommended. We believe, changes can be brought into the current medical teaching and learning to make the process more fruitful and successful.

**Key words:** Information technology, medical education, technology gap, web-based applications

## INTRODUCTION

Social media, web-based applications, and internet has revolutionized communication process over the last 2 decades. Similarly, learning and teaching process in the field of medicine had transformed slowly and progressively to suit the changes according to the

geographical and economic constraints. We in this study, aimed to determine what the thoughts were among the current undergraduate students and the teachers in the Irish Republic on introduction of technology and web-based applications in current medical curriculum. We also have questioned if this is necessary or not to bring forth any change from learning and teaching perspective.

In the near future, one should not be surprised to come across an advertisement on the web stating... ‘Complete Medicine from home in 4 years’ from a virtual University offering distance education. We hope this does not happen, compromising the traditional art of learning and teaching medicine in medical schools across the globe.

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Recently, a news in the media stated that Indian Government has announced a major program in partnership with a British company to produce a tablet computer that will be made available to students for only £26.<sup>[1]</sup> We certainly believe that the addition of the gadgets and inclusion of web-based technology in medical school will be certainly being beneficial. Recent reports also have revealed that the Republic of Ireland has been lagging behind in information technology based learning.<sup>[2]</sup> This includes the faculty of medicine amongst other faculties offering education to Irish students. This is another reason why we felt this study may be beneficial in highlighting the potential ‘technology gap’ if there is one that currently exist. This study is based on the assumption that a 4<sup>th</sup> year medical student would reasonably be competent in the basics of information technology particularly using the internet and using web-based resources for learning. The teachers and medical professionals were also included to make this study more complete getting bilateral views than being biased towards the students.

## OBJECTIVES

- To determine if modern information technology and web-based applications can be incorporated in the current undergraduate medical curriculum in the Republic of Ireland.
- To determine how receptive the medical students are in incorporating the recommended views/changes in this study.

- To determine if the teachers and medical professionals agree or disagree to the same proposed.

## MATERIALS AND METHODS

A cross-sectional study involving 202 participants of which 152 of them were 4<sup>th</sup> year medical students and 50 of the medical professionals (teachers & hospital doctors) within the Republic of Ireland. This involved three different medical universities namely University College Dublin (UCD, National University of Ireland, Galway (NUIG) and University College Cork (UCC) representing the country. A 15-point questionnaire was framed incorporating various fields of technology where changes in teaching and learning in medical education can be introduced [Table 1]. Participants were made to answer the questions or comments based on Likert psychometric five-point scale (strongly agree-1; agree-2; don't know-3; disagree-4; and strongly disagree-5).

Two methods were used to collect the data. The participants in the UCC had the questionnaire distributed by the authors in person and the other group involving UCD and NUIG had an online version of the same questionnaire using survey monkey. The data from the survey was analyzed using Statistical Package for Social Sciences (SPSS) software to determine statistical significance.

**Table 1: 15-point questionnaire used for the study**

		1	2	3	4	5
Q1	The introduction of the internet has changed the way you communicate and find information related to medical learning					
Q2	The introduction of medical e-books (online textbooks) is better than buying the medical text books					
Q3	I will be able to adapt should I be taught in a virtual learning environment (education system based on the web)					
Q4	The use of virtual patients to stimulate real life cases will help me understand a certain medical condition better than real patients					
Q5	Each student should be given an iPad/laptop to make supplement reading during class lectures					
Q6	Lectures should be made in the form of podcasts so students will be able to download them at home on their devices and be able to hear the entire lecture again					
Q7	Lectures should be streamed live on the medical school website so that even if you were unable to attend lectures you could access them from distance					
Q8	Wireless mobile labs should be set up so that students can use their own devices to supplement learning					
Q9	Medical lectures from different school should be uploaded onto a specific site so students could access lectures of the same topic from different schools					
Q10	Students and lecturers should use <i>Dropbox</i> like applications to upload lectures and question banks so that it could be shared from one year to another					
Q11	Lectures should use more modern software such as 3D projectors instead of chalkboards to make lectures more interesting					
Q12	Applications like <i>web3D Consortium</i> can be used to simulate patient's roles in any scenario and should be used to teach medical students					
Q13	Does a more modern classroom (3D projectors and laptops) likely to make you more interested in going to class compared to the conventional classroom without them?					
Q14	Medical schools should buy rights to sites like <i>TED (Technology, Entertainment, Design) International</i> so they can use <i>TED talks</i> in daily classes					
Q15	The use of applications such as Adobe and Blackboard on portable devices help me to manage my work better					

## RESULTS

A total of 202 participants were involved in the study. The overall scores obtained from the survey shows that both the medical students and the teachers have a positive attitude towards the introduction of more up-to-date technology in medical education. Table 2 summarizes the above statement. No statistically significant difference was noted between the two methods utilized for data collection utilized in this study.

Few statements among the 15 had a mean of about 2.5 out of 5, which indicated that participants were unsure about the benefits these ideas could bring to the current medical curriculum. We subsequently proceeded to analyze these statements in detail and identified that two of the statements that were not be favorable to the participants. The first statement was regarding the introduction of medical e-books (online books) and the idea that they may be better than actual textbooks. This statement received a mean of 2.65. On further analysis we also noted that 50% of the participants actually did indeed favor the introduction of medical e-books. However, it was also very obvious that there were some participants completely against the idea of medical e-books. Table 3 summarizes the overall individual responses of the participants to the 15 questions.

The second statement that got mixed reviews was on inclusion of '3D projectors' and 'laptops' in modern classroom. We anticipated that this would interest students attending conventional classroom. The mean value from the participants obtained was 2.53. Again there seemed to be an obvious pattern similar to the

previous question. Table 2 describes the individual responses of participants for this particular statement. The rest of the questions clearly seemed favorable to both the groups (students and teachers). Table 4 depicts the statistical comparison with the mean difference to the rest of the values.

## DISCUSSION

Most of the statements that we adopted to incorporate in the questionnaire were well-accepted and in fact some of the statements that received the best responses included the utility of *Blackboard* and *Dropbox application*. Medical students seem to favor online methodology of managing their work, as it proved easier and handier than the conventional method. Utility of software like *Skype* and *Vadoo* was also well accepted as an alternate methodology of attending lectures from different universities. Podcast of medical lectures seemed to be appreciated well as students had the luxury of listening to their lectures of choice without limitations to the number of times they wanted to view them to get their concepts clear.

These ideas may have logistical setbacks to make its way into the current curriculum, however these ideas seemed to have been received well by the students and teachers. We are hoping that this study may potentially initiate a change in the system if feasible.

A plethora of literature supporting this already exists and we have attempted to review a few that we felt may be appropriate. In the United States in 1997, an Association of American Medical Colleges (AAMC) Medical School Graduation Questionnaire revealed that use of computers

**Table 2: Does a more modern classroom (3D projectors and laptops) likely to make you more interested in going to class compared to the conventional classroom?**

		Frequency	Percent	Valid percent	Cumulative percent
Valid	Strongly agree	30	14.9	14.9	14.9
	Agree	80	40.6	40.6	55.4
	Don't know	48	23.8	23.8	79.2
	Disagree	36	17.8	17.8	97.0
	Strongly disagree	6	3.0	3.0	100.0
		202	100	100	

**Table 3: The introduction of medical e-books (online books) is better than actually buying the medical text books**

		Frequency	Percent	Valid percent	Cumulative percent
Valid	Strongly agree	27	13.4	13.4	13.4
	Agree	75	37.1	37.1	50.5
	Don't know	52	25.7	25.7	76.2
	Disagree	36	18.3	18.3	94.6
	Strongly disagree	10	5.4	5.4	100.0
	Total	202	100.0	100.0	

**Table 4: Statistical analysis of the data collected for each question utilised in the study**

One sample statistics	N	Mean	Standard deviation	Standard error mean
The introduction of the internet (www) has changed the way you communicate and find information related to medical learning	202	1.87	.896	0.063
The introduction of medical e-books (online books) is better than actually buying the medical text books	202	2.65	1.092	0.077
I will be able to adapt should I be thought in a virtual learning environment (education system based on the web)	202	2.21	1.024	0.072
The use of virtual patients to stimulate real life cases will help me understand a certain case better	202	2.20	.889	0.063
Each student should be given an <i>iPad/laptop</i> to make supplement reading during class lectures (should the need arise to do so)	202	2.32	1.017	0.072
Lectures should be made in the form of podcasts so students will be able to download them at home on their devices and be able to hear the entire lecture again	202	2.13	.986	0.069
Lectures should be streamed live on <i>Skype</i> , etc., so that even if you were unable to attend lectures you could access them from home	202	2.18	1.075	0.076
Wireless mobile labs should be set up so that students can use their own devices to supplement learning	202	2.22	.990	0.070
Medical lectures from different school should be uploaded onto a specific site so students could access lectures of the same topic from different schools	202	1.96	.907	0.064
Students and lectures alike should use <i>Dropbox</i> like applications to upload lectures and question banks so that it could be shared from one year to another	202	2.12	1.008	0.071
Lectures should use more modern software such as 3D projectors instead of chalkboards to make lectures more interesting	202	2.10	.982	0.069
Applications like <i>web 3D consortium</i> can be used to simulate patient's roles in any scenario and should be used to teach medical students.	202	2.10	.933	0.066
Does a more modern classroom (3D-projectors and laptops) likely to make you more interested in going to class compared to the conventional classroom	202	2.53	1.042	0.073
Medical schools should buy rights to sites like <i>TED (Technology, Entertainment, Design) International</i> so they can use <i>Ted talks</i> in daily classes	202	2.11	.981	0.069
The use of applications such as <i>Adobe and Blackboard</i> on portable devices help me to manage my work better	202	2.05	.950	0.067

had increased from 37 to 71%, over a 9 year period.<sup>[3]</sup> A decade later; a Finnish study looked at the opportunities new technology may provide for medical education. They concluded that in both universities involved, it appeared that medical teachers and students had a very positive attitude toward the advances in modern technology. Teachers, however, used information technology more in their research work than in teaching.<sup>[4]</sup>

Looking beyond the web-based applications there are studies to prove that inclusion of modern gadgets may prove beneficial in the field of medical education. Recently, a study<sup>[5]</sup> was carried out looking into incorporation of iPads into a preclinical curriculum revealing a mixed attitude towards the idea. Focus group data indicate students appreciate certain aspects of iPad use in the curriculum, including improved curriculum interactivity, but the majority believes it cannot replace printed handouts at this time. A separate study carried out in the United Kingdom on the use of smartphone and medical related apps among medical students and junior doctors also showed promising results.<sup>[6]</sup> The study concluded that there is a high level of smartphone ownership and usage among medical students and junior doctors. Both groups endorse the development of more

apps to support their education and clinical practice. Another interesting research was carried out in Brazil to see the impact of cybertutor in dermatological teaching. According to this study, multimedia programs may be used for undergraduate education in dermatology as a complementary educational tool.<sup>[7]</sup> It is generally accepted that information technology (IT) is a highly desirable and a very necessary ingredient of modern healthcare.<sup>[8]</sup> A survey carried out by Nebraska National Air Guard on the combined use of Skype and the STORZ CMAC video laryngoscope in field intubation training also highlighted the fact that web-based applications are being considered not only by medical students, but also by the other sectors to aid in medical education using Skype and VoIP.<sup>[9]</sup> Studies have also proven student preference for computer-assisted or digital technologies; a study was developed to determine whether it was more successful than a conventional radiology textbook in assisting dental students with the learning of radiographic anatomy.<sup>[10]</sup> Results showed that whilst traditional textbooks are still valued in the dental curriculum, it is evident that the preference for computer-assisted learning of oral radiographic anatomy enhances the learning experience by enabling students to interact and better engage with the course material.



The above examples show the diverse nature of how technology can be adopted for medical education. Our study had taken a fraction of the 'omnipotent' technology into medicine where some of the advancements can be successfully utilized for teaching and learning in Irish medical schools.

## LIMITATIONS OF THE STUDY

Small number of participants involved in the study. Only three medical universities were involved including only 4<sup>th</sup> year medical students. One may consider these as the confounding factors. As our main focus was on the students, more numbers of students were chosen in comparison to the teachers (1:3 ratio). This is another limitation of the study. Perhaps involving the management of the medical universities can be included to see the logistics of bringing forth the changes eventually or not. With our preliminary results obtained, a large-scale study can be initiated to substantiate our results.

## CONCLUSION

There is an obvious need for computer-based learning and teaching in medical education. Modern technology and digital learning environments aid different kinds of learning processes pertaining to different group of students and teachers around the world. Medical teachers may be able to meet these challenges and adapt appropriately to the evolving trends utilizing methods that may enhance their own and medical students' ways of learning.

The survey was well received by the participants with 91% of them having positive attitudes to the idea being proposed. A 10<sup>th</sup> of the participants seemed doubtful of the need for change and our ideas, but nevertheless the vast majority is hoping for a revamp of the education methodology in the Irish Republic. This study is an initiative to look at the thoughts of students and teachers and we acknowledge there may be significant logistical limitations to bringing forth changes and few may disagree to our ideas. A large study is recommended involving more participants across the medical schools in Ireland and may throw more light on this topic. We also hope that the concept utilized

may become reality in the near future if the educational facilitators feel that this is appropriate and also to meet the challenges medical education may face in the future in Ireland.

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