Flipped Classroom in Bioethics Education: A Blended and Interactive Online Learning Courseware that Enhances Active Learning and Student Engagement

Molly P. M. Wong

Abstract—In this study, a blended and interactive e-learning Courseware that our team developed will be introduced, and our team’s experiences on how the e-learning Courseware and the flipped classroom benefit student learning in bioethics in the medical program will be shared. This study is a continuation of the previously established study, which provides a summary of the well-developed e-learning Courseware in a blended learning approach and an update on its efficiency and efficacy. First, a collection of animated videos capturing selected topics of bioethics and related ethical issues and dilemma will be introduced. Next, a selection of problem-based learning videos (“simulated doctor-patient role play”) with pop-up questions and discussions will be further discussed. Our findings demonstrated that these activities launched by the Courseware strongly engaged students in bioethics education and enhanced students’ critical thinking and creativity. Moreover, the educational benefits of the online art exhibition, art jamming and competition will be discussed, through which students could express bioethics through arts and enrich their learning in medical research in an interactive, fun and entertaining way, strengthening their interests in bioethics. Furthermore, online survey questionnaires and focus group interviews were conducted. Our results indicated that implementing the e-learning Courseware with a flipped classroom in bioethics education enhanced both active learning and student engagement. In conclusion, our Courseware not only reinforces education in art, bioethics and medicine, but also benefits students in understanding and critical thinking in socio-ethical issues, and serves as a valuable learning tool in bioethics teaching and learning.

Keywords—Bioethics, courseware, e-learning, flipped classroom.

I. INTRODUCTION

This is a multi-disciplinary, faculty- and university-wide study, which involves collaboration of the Medical Faculty, The Chinese University of Hong Kong Centre for Bioethics and Information Technology Services Centre in the study of bioethics and medical advancement research. This study aimed to develop a multifunctional courseware that strongly bridges the gap between bioethics and medical advancement research in the undergraduate courses. An interactive e-learning Courseware (CU-MED-IBIOETHICS), which was implemented into Blackboard, the online teaching platform, is introduced. This Courseware could be applied not only to the current Bioethics Courses, in the undergraduate medical curriculum, but also potentially to other non-medical programs for the benefit of students in different disciplines across the University.

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There were three main objectives and pedagogical goals that this study aimed to achieve: (i) to enhance students’ interests in bioethics and related medical advancement research and technology; (ii) to enrich students’ learning in arts, bioethics and medicine, enable them to express bioethics through art, and facilitate their understanding of the basic principles of bioethics; and (iii) to reinforce students’ critical thinking and problem-solving skills with regard to socio-ethical issues on advanced scientific and clinical research, and enable them to recognize and appreciate different policies and regulation of medical advancement research.

First, a series of problem-based learning videos (“simulated doctor-patient role play”) and short animation experiences were incorporated into the Courseware. This enabled students to engage in the learning of bioethics, reproductive technologies and medical advancement research technology and enhance their creativity.

Next, an online art competition (I-BIOETHICS Art Competition) was organized via Blackboard, which allowed students to conduct fun and relaxing art jamming while expressing bioethics through arts so as to enhance their understanding of the basic principles of bioethics, and critically analyze and debate scientific and ethical issues on advanced scientific and clinical research. The educational benefits of the online art exhibition, art jamming and competition are undeniable, through which students could express bioethics through arts and enrich their learning in bioethics and medical research in an interactive, fun and entertaining way, strengthening their interests in bioethics and humanities.

Last but not least, this study empowered students to recognize and appreciate different policies and regulation of medical advancement research. Taken together, our study significantly reinforced education in art, bioethics and medicine, benefitted students in the understanding and critical thinking in socio-ethical issues, and, more importantly, provided a valuable and useful learning tool to enable students to continue lifelong learning through their medical careers.

II. PROCEDURE

A. Development of the Interactive e-Learning Courseware (CU-MED-IBIOETHICS)

The interactive Courseware consists of five micro-modules as follows: (i) The Four Principles of Bioethics (also known as Health Care Ethics or Medical Ethics); (ii) Embryo Ethics; (iii) Reproductive Technology; (iv) Adolescent Informed Consent;
Similar results were obtained regarding the rest of the question which was consistent with our preliminary studies [1]-[3].

Courseware engaged students in bioethics education and strongly agreed (80%) or agreed (20%) that the e-learning (Fig. 1). BIOETHICS, in a flipped classroom approach, were received results on the use of the interactive Courseware, CU-MED-research.

Ethical issues pertinent to modern-day scientific and clinical bioethics, and critically analyze and debate scientific and abstract graffiti, etc. which allowed students to conduct fun and Artwork broadly includes comics, drip-painting, photographs, abstract graffiti, etc. which allowed students to conduct fun and relaxing art jamming while expressing bioethics through arts so as to enhance their understanding of the basic principles of bioethics, and critically analyze and debate scientific and ethical issues pertinent to modern-day scientific and clinical research.

Focus Group Interview and Survey Questionnaires

A focus group interview targeting a small group of medical students (n = 10) in the undergraduate medical program was conducted. In addition, survey questionnaires regarding the pedagogical experiences on the animations and videos in these micro-modules were distributed to the medical students in a pilot study and completed questionnaires were collected and results were analyzed.

C.1-BIOETHICS Art Competition

An online art competition (I-BIOETHICS Art Competition) was organized via Blackboard. The objectives were: (i) to raise awareness for ethical issues in bioethics; and (ii) to encourage and promote creativity in bioethics learning outside the classroom. Students in the pre-clinical years of study in the undergraduate medical program were invited to join the competition and submit their artwork by choosing among the five topics as stated in the Procedure, II. A. Development of CU-MED-IIBIOETHICS, and designing their own theme. The Artwork broadly includes comics, drip-painting, photographs, abstract graffiti, etc. which allowed students to conduct fun and relaxing art jamming while expressing bioethics through arts so as to enhance their understanding of the basic principles of bioethics, and critically analyze and debate scientific and ethical issues pertinent to modern-day scientific and clinical research.

III. RESULTS

Constructive comments and feedback were obtained in the focus group interview and survey questionnaires, and positive results on the use of the interactive Courseware, CU-MED-BIOETHICS, in a flipped classroom approach, were received (Fig. 1).

Majority of the students’ feedback indicated that they either strongly agreed (80%) or agreed (20%) that the e-learning Courseware engaged students in bioethics education and enhanced students’ critical thinking and creativity (Fig. 1), which was consistent with our preliminary studies [1]-[3]. Similar results were obtained regarding the rest of the question items listed in Fig. 1. For example, about 40% strongly agreed and 60% agreed that the online activities introduced by the Courseware enable students to enhance their creativity and critical thinking in relation to the learning of bioethics, and that the blended and interactive online Courseware in bioethics could bridge art, bioethics and medicine for learning advancement and flipped learning, and with the use of the interactive Courseware in a flipped classroom approach, students could engage more actively in classes. Furthermore, majority of the students agreed that the instructions and guidelines provided in the online learning Courseware are clear, detailed and useful (40% strongly agreed; 60% agreed), and that the Courseware enables students to find learning bioethics more fun, interesting and entertaining (100% strongly agreed) (Fig. 1). The majority of the feedback also showed that they either strongly agreed (60%) or agreed (40%) that the online activities introduced by the Courseware could provide a useful learning tool in bioethics and medical teaching. Moreover, the positive and encouraging open-ended positive comments and feedback on the pedagogical experiences regarding the animations, problem-based learning videos, and the simulated doctor-patient role-play videos in the micro-modules of the Courseware were received (Table I), in which some of the results were also found to be consistent with those in the preliminary study [2]. These results demonstrated that the activities introduced by the e-learning Courseware as implemented with a flipped classroom in bioethics education enhanced both active learning and student engagement, and significantly reinforced students’ understanding and critical thinking in bioethics and socio-ethical issues. Furthermore, students could engage more actively in classes and find learning bioethics more fun, interesting and entertaining.

Among the micro-modules, various ethical concerns relating to embryonic research and reproductive technology: (i) personal ethics; (ii) research ethics and (iii) social ethics, in particular, were discussed. For example, personal ethics includes personal duties and responsibilities, research ethics involves acts of dishonesty, informed consent, plagiarism and cheating, while social ethics relates to concerns about reproductive cloning, derivation of stem cells from surplus embryos donated by in vitro fertilization (IVF), and creation of embryos specifically for research purpose [4]-[6]. Furthermore, students were engaged in classes through the use of the problem-based learning videos and animations, and students’ understanding of embryonic research and medical research advancement and the associated bioethics could be further enriched by introducing online discussion platforms and pop-up questions in CU-MED-IIBIOETHICS.

In addition to the introduction of bioethics and medicine, several real-life case studies and scenarios were selected for transformation into a series of problem-based learning videos (simulated doctor-patient consultation role play) which were developed in this study in order to enhance student learning and critical thinking in a practical way. The use of real-life cases and blended teaching, and the sharing of real-life experiences among students can influence student learning through integrative thinking. This has also been shown by a previous
study [7]. These engaged pedagogical approaches were implemented in this study by transforming real-life scenarios into integrative online teaching videos, revealing the advantages of using videos in problem-based learning in bioethics and medicine. Similar findings have also been shown by a previous study [8].

To strengthen students’ interests in bioethics and medicine, an annual art exhibition, art jamming and competition, titled I-BIOETHICS Art Competition was organized. These activities could benefit and engage students in the understanding of bioethics and medicine. Previous studies have revealed the benefits and importance of visual arts in teaching ethics in medicine [9]-[11]. These artworks (new creations by students) were able to engage students in ethical and creative thinking, and to encourage them in ethical and empathic thinking. Through these activities, students could be engaged in abstract and creative thinking, their observation skills could be enhanced, and their ethical and empathic thinking could be encouraged in a fun, interactive and entertaining way. Furthermore, these artworks could be applied for medical profession education and the transfer of skills into medical and biomedical science and their importance in learning has also been revealed by previous studies [12], [13]. Taken together, these events and activities strengthened students’ interests in medical advancement research and ethical concerns.

IV. DISCUSSION AND FUTURE WORK

Following up on the focus group interview, survey questionnaires and the pilot study, a large-scale study of online survey questionnaires targeting medical students in the pre-clinical years of study (n = 300) is currently in progress. A total of about 50 completed survey questionnaires have been received and the results obtained from the online survey questionnaires on the effectiveness and efficiency of the blended learning and the e-learning Courseware in Bioethics will be further analyzed. In addition, both quantitative and qualitative feedback and comments, from students who have visited and engaged in the interactive e-learning Courseware, CU-MED_IHIOETHICS, on its practicability and effectiveness in aiding online learning of bioethics and medicine advancement research, will be collected. The number of visits will be recorded and monitored regularly. Moreover, feedback on various pedagogical experiences will be collected and analyzed, and all successful cases and good practices will be documented in records in order to further evaluate the effectiveness of these e-learning tools in bioethics education, active learning, and engagement of students in these learning activities.

V. CONCLUSION

Taken together, the Courseware developed in this study could strengthen education in art, bioethics and medicine, significantly raise students’ awareness of socio-ethical concerns from the advancement of medical technology, and provide a useful learning tool in medical teaching. The e-learning Courseware, CU-MED_IHIOETHICS, could not only enable students to understand basic concepts in medical advancement research and bioethics, but also allow students to apply these concepts into future practice. This study can significantly impact the teaching and learning of art, bioethics and medicine by building the link between bioethics and policies in the regulation of advanced scientific research and medical technology, which enables students to recognize and appreciate the importance of ethics and humanities associated with medical advancement.
TABLE I
POSITIVE FEEDBACK AND OPEN-ENDED COMMENTS OBTAINED FROM SURVEY QUESTIONNAIRES IN A PILOT STUDY (N = 10) REGARDING THE E-LEARNING COURSEWARE, CU-MED-BIOETHICS, WITH A FLIPPED CLASSROOM AND BLENDED LEARNING APPROACH

<table>
<thead>
<tr>
<th>No.</th>
<th>Positive Feedback and Open-ended Comments</th>
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<tbody>
<tr>
<td>1.</td>
<td>“I strongly agree/agree the online activities introduced by the Courseware enable students to enhance their understanding in various core principles in bioethics.”</td>
</tr>
<tr>
<td>2.</td>
<td>“I strongly agree/agree the online activities introduced by the Courseware enable students to engage in the learning of bioethics.”</td>
</tr>
<tr>
<td>3.</td>
<td>“I think the problem-based learning (“simulated doctor-patient consultation role play”) videos which mimic real life case scenarios and Q&amp;A sessions introduced by the Courseware are most effective in engaging students in the learning of bioethics.”</td>
</tr>
<tr>
<td>4.</td>
<td>“I think the short video animations which introduce the core concepts of online activities are most effective in enhancing students’ understanding and knowledge on the subject matter.”</td>
</tr>
<tr>
<td>5.</td>
<td>“The animations provide detailed information on various core concepts and principles with practical examples. They are appealing and interesting.”</td>
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<tr>
<td>6.</td>
<td>“I strongly agree/agree the online pop-up questions introduced by the online learning Courseware allowed me to have a better understanding of the subject matter in relation to the learning of bioethics.”</td>
</tr>
<tr>
<td>7.</td>
<td>“I believe that effective learning is best achieved by on-campus, person-to-person teaching along with the e-learning activities. The blended learning engaged students in and outside the classroom, improving their participation and interaction in classes.”</td>
</tr>
<tr>
<td>8.</td>
<td>“I strongly agree/agree the online activities introduced by the Courseware enable students to enhance their creativity and critical thinking in relation to the learning of bioethics.”</td>
</tr>
<tr>
<td>9.</td>
<td>“I strongly agree/agree the online activities introduced by the Courseware could enhance students’ recognition and argumentation of socio-ethical issues related to advanced scientific and clinical research and technology.”</td>
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<tr>
<td>10.</td>
<td>“Recognizing the importance of a good voiceover: Not only does a human voice help the audience to concentrate better, but it can also serve the purpose of highlighting certain key points using the human voice intonation and rhythm.”</td>
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<tr>
<td>11.</td>
<td>“Transitions between different scenes within the video module: Sometimes, a pause between scenes will be helpful for the students to take a moment to reflect on what they just watched. Inserting a short rhetorical question at this pause can also encourage students to reflect and think critically.”</td>
</tr>
<tr>
<td>12.</td>
<td>“I found the discussions in my tutorial groups very engaging. In Zoom, we can be separated into smaller groups in the breakout room which helps facilitate our discussions.”</td>
</tr>
<tr>
<td>13.</td>
<td>“I have got used to online teaching since the COVID-19 pandemic, which offers great flexibility and more interactive sessions, but face-to-face teaching helps push students to voice out their concerns and suggestions, so a hybrid mode seems to be a better choice.”</td>
</tr>
<tr>
<td>14.</td>
<td>“The pop-up questions are most effective in enhancing students’ understanding and knowledge on the subject matter. These questions allow students to think and reflect on the ethical matter.”</td>
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<tr>
<td>15.</td>
<td>“The instructions and guidelines provided in the e-learning Courseware are clear, detailed and useful.”</td>
</tr>
<tr>
<td>16.</td>
<td>“I strongly agree/agree the online activities introduced by the Courseware enable students to find learning bioethics more fun, interesting and entertaining.”</td>
</tr>
<tr>
<td>17.</td>
<td>“I strongly agree/agree the online activities introduced by the Courseware could provide a useful learning tool in bioethics and medical teaching.”</td>
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ACKNOWLEDGMENT

This study was funded by the Courseware Development Grant Scheme 2019-2022 (Scheme 1), The Chinese University of Hong Kong.

REFERENCES


