Effectiveness of goal-based scenarios for out-of-class activities in flipped classrooms: A mixed-methods study*

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Flipped classroom (FC) has gained attention as an active learning approach. Designing effective out-of-class activities to help prepare students for in-class activities is fundamental for successful implementation of FC. This study investigated the effectiveness of Goal-Based Scenarios (GBS) for out-of-class learning in FC. Four out of twelve units in a medical humanities course for Year 2 medical students was redesigned into a FC format, where e-learning modules were designed using a GBS approach for out-of-class activities and classroom debates were implemented for in-class activities. The other eight units were delivered in a conventional classroom debate format, which included reading text materials as pre-class assignments. A formative evaluation study was conducted using questionnaires and interview methods and students' academic achievements were evaluated by comparing their pre- and post-test scores between FC and conventional units. Students had positive perceptions of the e-learning modules in GBS approach and preferred the structure of learning in the FC format. Students' pre-test scores were slightly higher in the FC units, yet their post-test scores were comparable with conventional units. This study illustrates students' perceptions that the learning was bettered structured in FC and that the out-of-class learning using the GBS approach helped them better prepared for in-class activities.

Keywords : Flipped classroom, Goal-based scenarios, Teaching and learning methods, Medical education

Introduction

There has been increasing attention on using the flipped classroom approach to create a more student-centered learning environment in various educational settings, which include medical education (Prober & Heath, 2012; Prober & Khan, 2013). In flipped classrooms, the learning contents are delivered to the students using technology, such as video lectures, before they meet in the classroom and then they engage in active learning in the classroom instead of lectures, thereby 'flipping' the in-class and out-of-class activities in conventional lectures (Bergmann & Sams, 2012).

In previous studies of flipped classrooms, the learning content for students' out-of-class activities often took the format of delivering lectures online, or slide presentations with accompanying narration (Bouwmeester, de Kleijn, ten Cate, van Rijen, & Westerveld, 2016; Ramnanan & Pound, 2017). More recently, a variety of study materials has been considered to serve students' personal learning preferences (Bouwmeester et al., 2016). As research shows that students may find preparing for flipped classrooms challenging (Park & Chae, 2018), designing effective out-of-class activities to help prepare students for in-class activities is fundamental for successful implementation of flipped classroom. Therefore, research is warranted on effective instructional design for out-of-class activities in flipped classrooms.

This paper suggests a flipped classroom model for a medical humanities course for medical students. In this format, e-learning modules were designed using the Goal-Based Scenarios (GBS) (Schank & Cleary, 1995) approach for out-of-class activities and classroom debate was implemented as an active learning strategy for in-class activities. Given the importance of medical humanities education for the professional development of doctors, there have been increasing needs for enhancing the teaching and learning of medical humanities to promote medical students' active learning in real-world contexts (Gordon & Evans, 2014). The GBS approach promotes student learning in real-world contexts using a guided inquiry

approach by engaging him/her in authentic tasks towards desired goals (Schank, Berman, & Macpherson, 1999). Therefore, an inquiry-based approach using GBS is suggested in designing flipped classrooms for medical humanities education to promote students' active construction of knowledge in real-world contexts. This paper reports evaluation of student perceptions of this instructional model and its learning outcomes.

Literature Review

There is evidence for the effectiveness of flipped classrooms in higher education (O'Flaherty & Phillips, 2015), and there is a growing body of literature that indicates it is a novel approach to teaching and learning in medical education (Hew & Lo, 2018; Kalaian & Kasim, 2017; Khanova, Roth, Rodgers, & McLaughlin, 2015; McLaughlin et al., 2014; Sharma, Lau, Doherty, & Harbutt, 2015). A recent systematic review of flipped classrooms in medical education indicates it is a promising teaching approach to enhance student motivation and engagement, yet more solid evidence is warranted of its impacts on changes in student knowledge and skills (Chen, Lui, & Martinelli, 2017).

Research has also focused on the effective design of flipped classrooms. Building upon the Revised Community of Inquiry framework (Garrison & Kanuka, 2004), Kim and colleagues (2014) suggest nine principles for designing flipped classrooms, which can be broadly applied to undergraduate courses. Hurtubise and colleagues (2015) posit flipped classrooms should be designed to engage students to build competency with a pedagogical and technological understanding of the flipped classroom framework. Lee and colleagues (2017) developed an instructional design model for flipped classrooms in higher education settings for creating an appropriate blend of individualized online lectures and collaborative face-to-face learning activities and found a significant improvement in student learning using

this model.

In flipped classrooms, educational technology is leveraged in the design of engaging out-of-class activities as well as active and collaborative in-class activities (Hurtubise et al., 2015). In particular, learning contents for out-of-class learning activities can be delivered by making prerecorded lectures and distributing them on the Internet or one can create e-learning modules, which include multimedia components, interactive features and quizzes. Past studies show technology can be conducive to promoting active learning and achieving positive learning outcomes in medical education (Carbonaro, et al, 2008; Kemp & Day, 2014). Still, research is scant on leverage various technologies to promote student learning in flipped classrooms.

GBS has been widely studied in various face-to-face and online settings and were found to be effective for enhancing student learning (Bell, Bareiss, & Beckwith, 1994; Kilic & Yildirim, 2012; Schoenfeld-Tacher, Madden, & Jones, 1998; Zumbach & Reimann, 2002). In particular, GBS can be an effective approach in the online environment because of the capability of computers to meet the needs of prerequisite conditions for the appropriate use of GBS (Schank, Fano, Bell, & Jona, 1994). The basic elements of GBS include; (a) learning goals that students should learn, (b) mission, which is the objective that students will pursue, (c) a cover story for creating and explaining the needs for the mission, (d) role that the student will play in the mission, and (e) resources that students will need to achieve the learning goals (Schank, Berman, & Macpherson, 1999). Although GBS has been widely used in various education settings, it has rarely been used in health professions education. A review of literature found only one relevant study that used GBS for a simulation program for nursing students (Park, 2017). Research is also lacking on the use of GBS for flipped classrooms.

Methods

Design and implementation of the flipped classroom

In this study, a medical humanities course was redesigned using a flipped classroom model. This course composed of twelve units that ran throughout the semester on a variety of topics on ethical and social issues in medicine. Four out of these twelve units were redesigned in a flipped classroom format based upon the nine principles suggested by Kim, et al. (2014). Table 1 describes these nine principles and how they were applied to the design of flipped classroom for this study.

This course was offered for Year 2 students in the six-year basic medical education program at a mid-sized private medical school in South Korea. Active learning approaches using classroom debate have been employed in this course since 2010, and it was observed that students generally did not come to class well prepared for the debate, except for members of teams assigned to present arguments for the debate. To resolve this problem, online modules were introduced as an out-of-class assignment in order to help students better prepared for the classroom debates. Prior to using e-learning modules, students were asked to read text materials provided by their peers and teachers.

A team of faculty members teaching in this course decided to adopt e-learning using the GBS approach for out-of-class activities to help students acquire relevant knowledge for classroom debates in real-world contexts rather than transferring information to them using video lectures. Accordingly, four e-learning modules were designed using the GBS approach, covering issues on clinical research, euthanasia, abortion, and end-of-life care. Accordingly, we designed e-learning modules according to the following five components of the GBS format: learning objectives, a case study, presentation of a mission and the student's role in it, a cover story to help him/her acquire more detailed information on the mission, and

Table 1. The Instructional Design Model of the Flipped Classroom Using the GBS* Approach

Principles for designing flipped classrooms (Kim et al., 2014)	The flipped classroom design
1. Provide an opportunity for students to gain first exposure prior to class	Offer students with an authentic learning environment for the out-of-class activity using a goal-based scenarios approach
2. Provide an incentive for students to prepare for class	Have students write a paper after completing the out-of-class activity, which is the topic for the following classroom debate
3. Provide a mechanism to assess student understanding	Offer quizzes and feedback for formative assessment at the start of the in-class activity
4. Provide clear connections between in-class and out-of-class activities	Students write a paper for the mission in the out-of-class activity, which is linked to the in-class activity as the topic of the classroom debate.
5. Provide clearly defined and well-structured guidance	Students are given a clear goal for the out-of-class activity using a goal-based scenarios approach. Also, the instructor facilitates and offer guidance on the classroom debate.
6. Provide enough time for students to carry out the assignments	Students are given instructions on the duration of time they are expected to spend for out-of-class activities.
7. Provide facilitation for building a learning community	Students are given a detailed guidance on how to work as a debate team.
8. Provide prompt/adaptive feedback on individual or group works	Faculty give feedback on group works at the end of the class as well as on the individual student report.
9. Provide technologies familiar and easy to access	The resources for out-of-class activities were easily accessible on the Internet

* GBS = Goal-Based Scenarios

supporting materials, including learning resources. Table 2 represents the structure of these e-learning modules and describes activities using the module on "Ethical issues in clinical research" as an example.

Table 2. The Structure of E-learning Module Based on the GBS Approach

Components of the e-learning module	Activities (Ethical issues in clinical research module)
Learning objectives	To explore ethical issues in conducting clinical research
Case study	Case studies of major events of unethical conducts in clinical research as an introduction to the topic
Role	You are a faculty member of an academic medical center and chair of the IRB committee.
Mission	Investigate ethical issues in a clinical research proposal with members of the IRB committee and make a decision on the approval of this research proposal.
Cover story	You are given a summary of the research proposal and informed consent form at the IRB meeting. At this meeting, ethical issues in this research proposal are discussed. Write a brief report on whether to approve this research proposal or not.
Supporting materials	Guidelines for ethical conduct of clinical research

In this module, the student is given a mission to play the role of a pediatrician at an academic medical center and a member of its Institutional Review Board (IRB). In this role, the student is asked to complete a mission, which is to review ethical issues in a clinical research proposal and decide whether or not to approve the study. The module also provides case studies of clinical experiments that raised concerns on ethics to help students understand the relevance and importance of the issue in the real world context. In addition, some learning resources and supporting materials are offered to help students conduct the mission, which include the research proposal and the informed consent form submitted to the IRB and guidelines on ethics in clinical research. Last, the student writes a short report on his or her opinions on whether or not to approve the study, which is the topic of classroom debate for the in-class activity.

Each e-learning module was developed by two content experts who were medical faculty and two instructional designers participated in the design of the modules. These e-learning modules were made available at the e-learning portal

provided by the Korean Consortium of e-Learning in Medical Education (www.mededu.or.kr). The students took the same e-learning module regardless of the positions they took during the classroom debate as it contained information for both positions. After completing the module, students engaged in a debate in the face-to-face class session on issues raised in the e-learning module.

The in-class activities consisted of a quiz to assess their knowledge on the topics that they learned from the out-of-class activities, the student debate, and the instructor's feedback and evaluations. Classroom debate was chosen as the instructional strategy for in-class learning in this course to foster student's active engagement in learning and development of higher order cognitive skills. In this classroom debate, students were assigned to eight teams and two of these eight teams participated in a structured academic debate. Each team was assigned to present the pros or cons, researched background information about issues, and the audience had to be peer reviewers and submit reports of the summary and reflection of the debate. The topic of debate was given from the mission the student performed in the e-learning module for their out-of-class activity before the classroom debate session. Each debate took approximately 120 minutes. The debate was moderated by a student, and the instructor gave an introduction to the topic, helped facilitate the debate and gave feedback to the students at the end of the class. The overall structure of the teaching and learning activities in this flipped classroom model is shown in Figure 1.

While the four units in the course was redesigned into the flipped classroom format using the GBS approach, the other eight units were delivered in a conventional classroom debate method, where students were given text materials as pre-class assignments to prepare for the classroom debate. The classroom debates for these eight units were delivered in the same manner as was done in the in-class activities in the flipped classroom units.
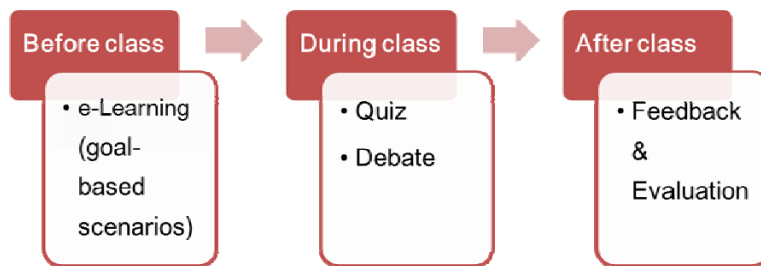
Figure 1. The Structure of Flipped Classroom Model

While the four units in the course was redesigned into the flipped classroom format using the GBS approach, the other eight units were delivered in a conventional classroom debate method, where students were given text materials as pre-class assignments to prepare for the classroom debate. The classroom debates for these eight units were delivered in the same manner as was done in the in-class activities in the flipped classroom units.

Study participants

The participants in this study (n = 94) were Year 2 medical students who has taken the medical humanities course being studied. The students were from two cohorts; 50 were from the year 2014 cohort and 44 were from the year 2015 cohort, 71% were male ($n = 67$), and 29% ($n = 27$) were female. The participants were undergraduate-entry students between 19 and 26 years of age (M = 21.1, SD = 1.37).

In addition to the survey study, four students among those in the Year 2 cohort in 2015 participated in the interview; three were male and one was female, and they varied in their academic performance in the medical program.

Study design and procedures

This study evaluated the effectiveness of this flipped classroom approach at the

student satisfaction and academic achievement level, which is the first stage in the holistic model for evaluating the impact of e-learning resources suggested by Pickering and Joynes (2016).

Student perceptions of the flipped classroom approach were evaluated using a mixed-methods approach. First, quantitative data was collected using a questionnaire on student perceptions of the e-learning modules using the GBS approach over two years in the years 2014 and 2015. The questionnaire included 14 items on student perceptions of the effectiveness of e-learning modules. These items were adapted from an instrument for evaluating the quality of e-learning modules by Rego and Ozolins (2007), and they reported the instrument was reliable with the co-efficient alpha being .95. Participants were asked to respond using a five-point Likert scale (1 = "strongly disagree" and 5 = "strongly agree"). The original English version was translated to Korean by the author and was pilot tested with three medical students to evaluate the clarity of the items. This questionnaire was self-administered by students and was implemented as part of course evaluation near the end of the course.

The quantitative study was followed by an interview for more in-depth understanding of student perceptions of this flipped classroom model using a qualitative research method. The semi-structured interview was conducted during the last week of the semester in December, 2015. The interview questions are listed in Table 3. The interview participants were selected so that they were diverse in their backgrounds (i.e., gender and age) and academic achievement levels. Consequently, four students consented to participate in the interview. The interviewer, who holds a Ph.D. degree in education, was an instructional designer who participated in the course design and was experienced in conducting interviews. The duration of the interview was approximately one hour and was recorded. The interviews were followed up via e-mail when additional questions arose from the initial analysis of the interview transcript.

Table 3. Student Interview Questions

1. What was your overall impression of the content of the e-learning module?
2. How long did it take for you to study the e-learning module?
3. Was the content of the e-learning module interesting for you? If so, how? If not, why?
4. Did you find it easy or difficult to study the e-learning module?
5. Which aspects of the e-learning module did you find particularly helpful or not helpful?
6. How was studying using the e-learning modules different from studying by reading text materials in the units in this course where e-learning modules were not offered for pre-study?
7. Which e-learning module did you like or dislike the most and why?
8. Did you find studying the e-learning module helped you better prepare for the classroom debate?
9. What is your overall impression of this flipped classroom approach?
10. How did you feel about the structure of learning in this flipped classroom format?
11. Did you feel the quality of debate improved by using the flipped classroom format?
12. Do you think we should increase the flipped classroom activities in this course or not?

Second, students' academic achievements were assessed by comparing their performance across different instructional methods in this course. As was described earlier, students learned in the flipped classroom format in four units in this course and in the other eight units the classroom debate method was implemented without using the GBS approach. Student performance was compared across these two instructional methods by comparing their scores in pre- and post-tests. The students took quizzes on what they had learned from the e-learning module as an out-of-class activity at the beginning of the class and they took the same test at the end of the class for each unit in the course. Each quiz consisted of 3-9 items in the multiple-choice question or short answer question formats. The pre- and post-test scores of the year 2015 cohort (n = 44) were compared across the units using conventional and flipped classroom methods.

Data analysis

The survey data were analyzed using descriptive statistics and a reliability analysis of was performed to check for its internal consistency. Additionally, a paired t-test was performed of students' pre- and post- test scores to compare their academic achievements between the two modes of instruction.

To analyze the qualitative data obtained from the interview, the recorded interview was transcribed verbatim and the transcript was analyzed. Emerging themes or patterns from the data was identified using the thematic analysis method (Terry, Hayfield, Clarke, & Braun, 2017).

Results

Students overall perceptions of e-learning modules

Out of a total of 100 students among the study cohorts, 94 returned and completed the questionnaires (a 94% response rate). The 14 items regarding students' overall perceptions of e-learning modules in the questionnaire demonstrated a reliable internal consistency, where the Cronbach α co-efficient was .94. Table 4 shows the results of the descriptive analysis on those 14 items regarding student perceptions of e-learning modules. The results showed participants had positive perceptions of e-learning modules.

The interview participants stated that completion of the out-of-class activity had taken 1.5-3 hours; the duration varied to some extent across modules. They estimated it had taken approximately 30 minutes for them to go through the e-learning module, and 1-2 hours for writing a report after finishing the mission. All participants agreed that the amount of time spent on the e-learning module and the workload was appropriate. According to the participants, although some of learning

Table 4. Student Evaluation of E-learning Modules Using the GBS Approach
(n = 94)

Item	Mean ± SD*
1. The e-learning module helped me to achieve my learning objectives.	3.53 ± 0.76
2. The e-learning module was written at the right level for me.	3.72 ± 0.72
3. The e-learning module was easy enough for me to understand.	3.70 ± 0.76
4. The e-learning module made it easy for me to learn on my own.	3.54 ± 0.89
5. The e-learning module helped me enhance my understanding of medical ethics.	3.70 ± 0.69
6. The mission in the e-learning module helped me improve ethical reasoning skills.	3.27 ± 0.85
7. The tasks given in the e-learning module helped me to consolidate my learning.	3.40 ± 0.86
8. The e-learning module helped me prepared for class discussions.	3.69 ± 0.87
9. The content of the e-learning module was relevant to real clinical settings	3.68 ± 0.73
10. The materials in the e-learning module helped me learn that I could not from other resources.	3.47 ± 0.80
11. The way the e-learning module was structured was helpful to my learning.	3.39 ± 0.88
12. Learning resources in the e-learning module are better than other conventional ones.	3.23 ± 0.81
13. I would recommend the School of Medicine use the e-learning module in the future.	3.26 ± 0.92
14. I would recommend other medical students to use the e-learning module.	3.19 ± 0.91

* 1 = "strongly disagree," 5 = "strongly agree"

resources in the e-learning module were quite lengthy with over 100 pages, it was not a heavy burden for them because they did not have to read through all of the pages in it, instead they focused on the part of the material relevant to the task. Furthermore, the papers the students turned in after completing the mission in the e-learning module was only 1-2 pages long, so they felt the workload was not overwhelming for them.

The results of the interview revealed that students preferred learning resources in the e-learning modules over the conventional text materials due to the convenient access in online settings. One student stated "The learning resources were available on the Internet, so it was better in terms of access to the information. We could get to more information through e-learning by using the Internet." Another student pointed out "it (e-learning) was much convenient because I could look up information whenever I needed as I was working on the mission in the e-learning module."

The participants agreed that their levels of interest or engagement in the e-learning modules varied depending on the clinical relevance of the topics, favoring those more pertinent to the practice of medicine over others. As stated by one student … "I felt the module on ethics in clinical research rather challenging. The topic itself was interesting enough, but as you know, I am not at the level of doing clinical trials yet, so I couldn't get a real sense of how realistic or serious the ethical issues were in that case."

Student perceptions of the effectiveness of the flipped classroom approach

The interview participants agreed that they felt the learning was better structured in the flipped classroom units when compared with the other conventional units. According to one student, "What I liked better about the debates after doing the e-learning modules than the others was that without the e-learning we were given the debate topic only and then we had to find information on that by ourselves. So, while I was searching for information, I could get lost and touch upon things that were not the main focus of issue to be discussed. But, when we debated after doing the e-learning module, we had background information on the topic to some extent, so we could focus on the main issues and I did not feel the discussions went off the topic. So, I felt the learning was better structured."

The interview participants agreed that the GBS approach in the e-learning

module was effective because the mission they performed in the e-learning module guided them to get information on and think about the issue from both sides of views on the issue. One student stated, "In the e-learning module, I had a mission of writing a report, and that made me think more clearly about the issues to be debated and be organized in my thinking, so I liked it because that made it easier for me to present my thoughts on the issues during the class. But, that's still a workload, because in other debates I could just come to class without much thinking or preparation, but in these e-learning modules I had to write a paper; that's somehow a burden, but it definitely helps."

Moreover, some students also pointed out the out-of-class activities using the guided inquiry approach were more effectively than by learning from reading conventional text materials. One student mentioned, "The e-learning module presents the mission first, that helps me know what information I need to look for from the learning resources. And then, I am also reminded of what I need to know while I do the mission, so I get to look up the resources again. And, I can find the information easily (in the e-learning module). That helps me remember what I read well enough that I can recall it when I make an argument during the classroom debate even though I read it just once."

Although students agreed that the e-learning in out-of-class activities helped them better prepared for classroom debates, they had mixed opinions regarding whether it led to an improvement in their performance in classroom debates. Students pointed out several things that likely affect their preparation for and participation in the classroom debates. They pointed out workload from other courses during the exam period as one of such factors. One student mentioned, "I think it was right after the mid-term exams, and I was the facilitator for the classroom debate for that week. I felt it did not go so well. I didn't know why at that moment, and I was wondering what I did wrong. So, I asked my peers for feedback and I realized that everyone was overwhelmed by the exams."

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Students' academic achievements

There were significant increases in student achievement between pre-tests and post-tests in both flipped classroom and conventional units ($t = 11.19$, 9.51, respectively, $p < 0.001$). Students' pre-test scores were slightly higher in the flipped classroom units ($t = 1.82$, $p = 0.09$), and their post-test scores did not differ between the two modes of instruction ($t = 0.29$, $p = 0.77$).

Discussion

In this study, a medical humanities course was redesigned into a flipped classroom format to promote students' active learning based upon the nine principles for designing flipped classroom (Kim et al., 2014). In this flipped classroom model, e-learning modules were designed using a GBS approach for out-of-class activities and classroom debates were implemented for in-class activities. Such an integration of e-learning into teaching and learning in the classroom is also in line with the recommendations found in the literature that technology be used to provide or support student experiences as a supplement to face-to-face experiences (Robin, McNeil, Cook, Agarwal, & Singhal, 2011).

This study examined the effectiveness of this flipped classroom method at the student satisfaction and academic achievement level. Students expressed overall positive perceptions of this flipped classroom approach. This finding is in line with other previous studies in which flipped classrooms were generally well received by medical students (Ramnanan & Pound, 2017). Particularly, students had positive perceptions of the e-learning modules in terms of the content and the usefulness for learning. Students preferred the e-learning in the GBS approach for their out-of-class activities and felt the learning was better structured in the flipped classroom format, which helped them prepare for the classroom debates. It can be

argued that the use of GBS approach in flipped classrooms are beneficial for student learning by making the learning content relevant to the task for their in-class activity and by making use of learning resources more convenient for them.

Although the students showed neutral responses to some items in the questionnaire, it can be argued such results are not negative considering the characteristics and the learning environment of medical schools. Due to the heavy workload of studying medicine, it is often challenging for medical students to find time for out-of-class activities (Bouwmeester, de Kleijn, ten Cate, van Rijen, & Westerveld, 2016; Park & Chae, 2018). The students in this study began to study medicine from Year 2, so they were taking medical courses while they were taking this flipped course.

This study indicates that some of the barriers of flipped classrooms found in previous studies were overcome in this model. First, past studies show students often do not prefer the flipped classroom method because it causes more workload for them by having to do out-of-class activities (Chen et al., 2017). This study indicates that students have positive perceptions of out-of-class activities when they are given learning activities authentic and structured for the subsequent in-class activities even though those are more work for them. As there are many approaches to designing e-learning modules for out-of-class activities - from lecture captures to more interactive ones - the effectiveness of e-learning may differ according to how it is designed. Our study shows out-of-class learning activities using the GBS approach is an effective instructional method for helping students prepare for in-class activities in flipped classrooms. Second, this study shows that students perceived the learning was better structured in this flipped classroom model than in the traditional format. A previous study by Ramnanan and Pound (2017) points out insufficient direction and structure in the flipped classroom may limit its benefits. This study indicates that the design of flipped classrooms using the nine principles by Kim et al. (2014) was effective in providing students with direction and structure for the learning.

Still, the present study does not provide conclusive evidence for better learning improvement by the flipped classroom approach over the conventional ones. This may be due, in part, to the fact that the student performance were assessed at the rote memorization level using pre- and post-test measures in this study. As the intention of this flipped classroom approach was to facilitate deeper learning by promoting classroom debates, future study examining student learning outcomes in higher-order cognitive skills is warranted to determine the impact of this instructional approach on student learning, which is the next phase in Kirkpatrick (1994)'s four-levels of evaluation model. In particular, a study of faculty perceptions of whether the e-learning modules helped enhance the quality of student debates is recommended to investigate the impact of this flipped classroom model on student learning at a higher-order thinking level.

The limitations of our study should be acknowledged. First, this study looked into one course with a relatively small number of students at one institution. Further study including a larger sample is warranted to enhance the generalizability of the findings. Second, the questionnaire used in this study was translated by the author and was validated at the level of checking clarity of the items only. Future study is warranted for further validation of this instrument including back-translation and analysis using item response theory. Third, this study was a formative evaluation of the flipped classroom model focusing on the first phase in Kirkpatrick (1994)'s evaluation model. Further study of this flipped classroom approach aimed at the higher levels in the evaluation model is warranted for better understanding of the effectiveness of this flipped classroom approach.

Based on the student anecdotes from this study, the outcomes of student debates depend on a variety of factors – the quality of e-learning modules, the level of difficulty of the topic, and the facilitator's skills, as well as workload from other courses that may take their attention and energy away from this particular course. Future studies that encompass such various factors are warranted to understand the impact of this flipped classroom approach on promoting student learning in

higher-order cognitive skills. Furthermore, design research is recommended for the design of the GBS approach to confirm the effectiveness of the principles for designing e-learning using the GBS approach used in this study and to improve them.

This study illustrates students' perceptions that the learning was bettered structured in this flipped classroom format and that e-learning using the GBS approach for their out-of-class learning activities helped them better prepare for the subsequent classroom debates. This study contributes to our knowledge by suggesting and formatively evaluating a new instructional model for medical humanities education. Still, future study is warranted to provide more conclusive evidence for learning improvement by this flipped classroom approach.

Although this study used classroom debate for in-class activity following the out-of-class learning using the GBS approach, it is believed that other learning in-class activities that promote active learning can be applied to our flipped classroom approach as well. Therefore, it is recommended that educators experiment with and study various design approaches for flipping classrooms to come up with its optimal use to enhance student learning in medical humanities education.

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