Students Voice in their Learning: Incorporating Students' Expectations in Learning Design of E-learning of Pharmacotherapy

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***Abstract*—This study reports our pioneering attempt in designing an e-learning module that not only increases students' engagement and improves their understanding utilizing multimedia but also incorporates student voices in the design of their own e-learning. The objective is to inform how students' expectations can be incorporated within the design processes of e-learning module, developed to transform teacher-centred to student-centred blended learning. Students' feedback and expectations were collected through Focus Group Discussions (FGDs) in two stages – one after a prototype module and the other after modified module incorporated learning design of students' feedback. FGDs have helped us to identify and ascertain essential features of e-learning module. The students' design components included effective multimedia, content that sufficiently addresses the learning outcomes, suitable active learning activity, and guided navigation. This was a novel learning design process of incorporating the students' voice in the design of their own learning. The design of the revised module resulted in it being more 'visual' and structured, thus being easier to navigate for student learning.**

***Index Terms*—student feedback on e-learning, learning design, students voice in learning design, pharmacotherapy learning, students' expectation**

I. Introduction

When blended learning has become a norm in higher education, by any means, development and incorporation of e-learning elements into our teaching seemed necessary. But designing e-learning does not always incorporate the voices of those whom it is developed for in the first place.

Pharmacology is an important, basic component of both the Medical and Pharmacy degree programs. Because of the nature of the subject, which consists of explaining the drugs' mechanism of actions, drugs' use or indications, and side effects, the subject is generally considered as very factual based and for students appears less engaging compared to other subjects. In a didactic teaching of pharmacology, explanation through use of complex diagrams and texts are provided so as not to miss out any important facts and information. While overburdening students with huge cognitive load, lecturers' are consciously aware that this approach may create fear and tension to the learning process of pharmacology.

In our attempt to convert from a purely didactic approach to a student-centred blended mode of learning [1] of pharmacotherapy, we sought to design an e-learning module [2] that not only increases students' engagement and improves their understanding utilizing multimedia [3] but also incorporate student voice on how the design meets their expectation for e-learning.

A prototype pharmacotherapy e-learning module, specifically on the subject of peptic ulcer disease (PUD) was designed on the Moodle platform and evaluated by Year 4 pharmacy students. Through multiple iterations, this module was redesigned, and used by Year 3 pharmacy students as a curricular blended module for PUD pharmacotherapy topic in Year 3.

To gather feedback and students' voice, two focus group discussions (FGD) with each of the cohorts of students were conducted on the prototype, and the revised versions. Throughout the process of developing and refining the module, which was our maiden attempt on a pharmacotherapeutic e-learning module, we incorporated into the blueprint both the available resources, the content and the pedagogical principles from us, as content experts as well as learning designers that could meet the objectives of module being both engaging as well as spreading the cognitive load across the different components of the modules. However, such design of the e-module was still teacher-centred (that by us) even though the delivery is student-centred. We opine that students' feedback needs to be incorporated within the design of e-learning [4].

In this paper, we report Pharmacy undergraduate students' attitude and expectations of e-learning of pharmacotherapy, which we gathered from FGD, and as researchers, content expert and learning designers, our reflection and experiences in developing this module.

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The objective is to inform how students' expectations can be incorporated within the design processes of e-learning module developed to transform teacher-centred to student-centred learning. As the reflections of designers are presented, the detailed description of the e-learning module is beyond the scope of this paper.

II. Methodology

A. Recruitment of Participant

A group of Year 4 pharmacy students was invited via Google Invite to review the prototype e-learning module, and to participate in a FGD after their review of the module. Similarly, Google Invite was sent out to the whole class of Year 3 pharmacy students, and students were given one week to provide their responses as to whether or not they agree to participate in this project. This study was approved by the Monash University Human Research Ethics Committee (approval number 2016-1466).

B. Conduct of Focus Group Discussion (FGD)

The FGD with Years 3 and 4 pharmacy students were conducted within two weeks after students have reviewed the module. Both FGDs were conducted by the same person who is not a researcher of this project. Discussions were audio- and video-recorded, and the transcript was matched with these recordings.

III. Results

A. Participant

Nine Year 4 pharmacy students responded to the request of reviewing the module, and all of them participated in the FGD. Twenty-seven Year 3 students (36% response rate) responded to the invitation of whom eight participated in the FGD. Only students who have agreed to participate were given access to the module, and they had 10 days to complete the module.

The researchers, as learning designers, then reflected on the design of the e-Learning module based upon the FGD.

B. Focus Group Discussion (FGD)

TABLE I. List of Questions Asked During FGD with Year 4 Students

Questions
1. Can you tell me about your previous experiences with online module?
2. What do you think would be the greatest advantage of e-learning?
3. What do you think about this online module?
4. What else do you think should be in the module?
5. How would you rate this module?
6. Imagine you are a very weak student; what suggestion would you give to the module?
7. Imagine you are the smartest student; what suggestion would you give to the module?

The FGDs were held in early 2017 with a month apart.

The first FGD (FGD1) included nine Year 4 with the discussions running for 56 minutes after the students had gone through the prototype e-module. Table I shows the list of areas that guided the feedback during the FGD. After the feedback, the students' voice and their expectations were analyzed using a thematic approach and incorporated into the design of the revised version of the module.

This revised module was further evaluated. Eight Year 3 pharmacy students, participated, and the discussions ran for 43 minutes. Table II shows the list of areas that guided the feedback. These FGD questions for Year 3 students focused on the PUD online module, with some questions referring specifically to the features that were designed either newly or changed as per the students' feedback and expectations collated from FGD1 (with Year 4 students).

TABLE II. List of Questions Asked During FGD with Year 3 Students

Questions
1. What do you think about this online module?
2. What do you think is the purpose of having this kind of online module having had lecturers speaking in class?
3. Do you think this module fulfil your expectation?
4. Were there part where you have to do questions that are of higher level?
5. What about the quality of the videos?
6. Among all the components in the module, which one is the best for you and why?
7. Is there any part of this module that you would like to improve?
8. Is the module would be more effective if it is done before lectures?
9. How would you rate this module?

In the FGD1, Year 4 students who assessed the prototype of the online module informed that they have experiences with online module since Year 1, and that Monash University has quite a number of online modules, but not one on gastrointestinal disease pharmacotherapy.

The students commented about their past experiences with e-learning, and felt that online modules are quite helpful. One student cited Chemistry subject as an example, and pointed out that animation of the chemical structure, which allowed visualization of the structure, had helped to improve his understanding of the subject. Another student echoed the point and highlighted pictures and charts are helpful in learning. All students agreed that the multimedia component in the online modules has made e-learning more interesting than lecture notes. They, however, prefer to use online modules for revision and to clarify understanding, than to use them for preparation of examination. As further explained by one of the students, 'unless I make my own notes based on the e-learning module, then I will use the module together with the notes to prepare for an exam'. Another student simply said that online module is inconvenient for quick reference compared to lecture notes. One student, however, felt that an e-learning module is useful as a preparation for lectures because in the class 'I can make sense out of what the lecturers said, clarify learning materials in the online module, which could help

deepening my understanding about the topic'. When referring to the PUD online module, students felt that browsing through the module is more interesting than reading through lecture notes. One student elaborated that videos, which showed the sequential action of drugs on the cell, as well as events in disease development are especially helpful in deepening understanding and retaining knowledge.

Referring to the active learning activities that were incorporated into the module, one student suggested that it is better that the quiz questions are related to the content presented in the online module. Otherwise, students will find those questions irrelevant, and hard to relate between what they have learned and what they are being tested. This student however, agreed that questions which have broader implication or are testing broader understanding are valuable and helpful for students who prefer self-directed learning. One student added on by saying that although answers couldn't be found from the resources given in the module itself, those questions stimulated his learning. A few students however mentioned that the module is only scratching the surface, and a student actually said that she won't be able to do the module without referring to her lecture notes.

Although it was reported that one of the advantages of e-learning is that students can re-visit the module including to re-attempt the quiz questions, one student replied that it only makes sense to re-visit the module if there is a large question bank. The student however, also thought that the videos and narration in animation would pitch interest and curiosity, thus encourage further reading. One student highlighted that it requires self-discipline to do an online module, while another student commented that the PUD e-learning module was really much better than the pre-recorded lectures that they had before.

When students were asked to give suggestion on areas of improvement for the module, student felt that the module can be more engaging such as having more kinesthetic features and interactivity as suggested by other authors [5], [6]. Another suggestion was to add a section that allows students to post questions or doubts related to the topic, of which the section would eventually form a bank of questions that students can refer to. Student also suggested converting case studies into a game-like or virtual format so that student can visualize the case, thus improves students' engagement. Most of the students also find that a summary about the whole e-learning module placed at the end would be helpful because that gives them an overall picture about the module as well as serving as a reminder for materials covered at the beginning of the module. There was suggestion that for learning materials that require memorization, incorporating a short quiz right after the material is presented would help to reinforce understanding, improve memory, and build up confidence.

While some students felt that external links and the additional handouts provided such as the Therapeutic Guidelines and journal articles are helpful, some students prefer just a summary of the list of resources so that they can have an overview of the resources that they need to go through. Technical wise, the flagging of resources was not clear, and students prefer videos and animation that come with narration. There was suggestion that a suggested time or duration is shown for each section of the module so that student can arrange their learning time accordingly. Student also pointed out that when a session has finished, student should be made aware of that so that they can move on to the next section of the module. The module could have a mix of easy and hard questions. On the scale of 1 to 10, with 10 being excellent, students gave an average of 7.4 rating to this module.

We revised the PUD online module, considering the comments and suggestion given by Year 4 students. We then designed the revised module and opened it to Year 3 students, following which a FGD was organized with them after they have completed the module.

This FGD focused on students' experiences with the PUD online module. As suggested by Year 4 students, all these students agreed that the videos, images, and 2D diagrams were very helpful in improving their understanding of processes and mechanisms. Only one out of eight students mentioned about the tendency to look up online for videos to obtain more information. The reason for this was explained by another student who said that students are sometimes not sure if the videos they found online are relevant at their level of study, or may carry too many details, which may in turn confused them. Besides the multimedia, students also liked the short quizzes as well as the summary diagrams incorporated into each section of the module. Specifically, the 'recall' type of questions had deepened their understanding on the topic, while the summaries had reinforced the knowledge learned.

When asked about the advantages of online module compared to the didactic lectures, students felt that the module acts well as a supplement and a refresher. They liked the fact that learning can occur anytime and that they can control the learning pace, 'playback', and pause at any time to look up for more explanation or information. Responding to question as to whether the module would be more effective if it is given before the lectures rather than after, students generally felt that it makes no difference but mentioned that they usually only reviewed an online module after lectures. This may be related to self-discipline because as mentioned by Year 4 students, it was again suggested by Year 3 students that 'we needed to discipline ourselves to study the online module'.

When students were asked to comment if the module has fulfilled their expectation, majority noted that the module met their expectation except one who has hoped for more in-depth knowledge such as pathways from the central nervous system, rationale of treatment as well as more details about the mechanisms of drug actions. All the other students agreed that the information given is sufficient, and has improved their understanding. Commenting on the quiz items, all the students agreed that the online module could have questions of varying levels of difficulty namely, easy, moderate, and advance

questions, and as such students could be given choices as to the type of questions they wish to attempt. But there was also student who wanted only questions that are related to lecture notes or are assessment oriented.

The authors, as learning designers, then explored on aspects of the module that we could improve further. While most students acknowledged that videos are the most useful in enhancing their learning, some students suggested addition of subtitles and narration to the videos. Case studies and the summaries are the other components that students liked most, followed by quiz questions. Students also prefer to have more interactivity and case studies in the online module. In fact, one of them asked if similar module can be developed for other gastrointestinal diseases. Out of the 10-point scale, the revised module was rated 8.3 by Year 3 students.

IV. Discussion

Our students' past experiences with e-learning made them suitable to evaluate the e-learning module as their opinion would be relevant and could represent the general expectation of students of this generation regarding e-learning. If based on the feedback from students on the revised module, we have successfully developed an online module of gastrointestinal pharmacotherapy that meets students' expectation of e-learning module design.

We attempted to group learning design factors that determine the success and effectiveness of e-learning into two categories – external and internal factors. External factors are those that are not directly related to the quality of an e-learning module, and these may include students' learning style and attitude towards e-learning. Internal factors refer to the design features of the module, which include the effective features, content, and navigation of the module [7]. Table III summarizes these variables that may determine the success of an e-learning module. We may interpret this as e-learning being more engaging for certain groups of students. But it is also appropriate to think that a good e-learning module may encourage students of other learning styles to somehow adopt this learning method, or at least these students may also learn better from an effective e-module incorporating certain learning design features.

TABLE III. Factors That May Positively Influence Students' Acceptance of E-Learning

External factors	**Description**
• Learning Style and attitude	Visual and/or kinesthetic learner Self-regulated learner
Internal factors	**Description**
• Effective features	Multimedia Interactivity Collaboration Chunking of information
• Content	Learning outcomes are well elaborated Information and resources are concise Suitable active learning activities Organization of materials and layout
• Navigation	Clear instructions Flagging of information and resources Suggested timing for each section of the module

With regard to the use of multimedia, students have indicated that pictures as with other studies [8] and animation arouses their interest, and had helped them to visualize specific mechanisms, and improved their understanding. This is in line with evidence that when students are motivated to learn, they will engage more to their learning, and that improves their performance [9]. It is worth mentioning that not all the animations in the revised module were with voice narration due to time constraint in adding the audio effect, yet audio does not seem to be very crucial in a video. We had in the revised module, increased the interactive component, yet some students still find it lacking, indicating the importance of interactivity in an online module, which may not be restricted to pharmacology teaching only. Based on the VARK analysis [10], our FGD data collectively suggests that online module maybe preferred more by visual and/or kinesthetic learners, than aural and read/write learners. Because of this, visual and kinesthetic learners would most likely refer to online resources for further reading, and they will need to be guided on online videos that are suitable for their learning.

Consistent with students' learning preference described above, it would appear that students who study online materials prefer to be looking at short notes, either in point form or summaries, and not long documents that may take time to read. While this may be explained as the internet reading behavior among students nowadays, it could also be due to limited attention span, although this notion is arguable [11]. We removed the handout of the Therapeutic Guidelines, and replaced it with an excerpt of the Guideline that is relevant in the management of PUD only. We also retained all the journal articles that we attached earlier on in the prototype module. Together, we would assume that it is acceptable to include extra reading materials and relevant external links into the module.

Short quizzes are among the most effective and preferred active learning activities in e-learning module. All the quiz questions were related to the learning

materials presented in the module. Questions were written in a way that they required students to recall the pharmacology of the drugs covered in the module as well as to associate the drug actions to the pathophysiology of PUD. We did not adopt the suggestion to include questions at different levels of difficulty in the learning design of the module due to concern of over-expanding the duration of the module. But students' feedback has again shown that they would appreciate the inclusion of such a component in the module. Suggestions to increase the number of case studies indicated that students like challenges, and opportunity to be tested on their critical thinking and problem solving skills. Students appeared to be very focus, and aimed to do well, and this was exemplified in their comments about case studies. Students felt that case studies which mimic real life case scenarios helped them to be more prepared when it comes to application of knowledge into practice.

Overall, FGDs from Years 3 and 4 students suggest that students generally have quite similar expectation with regards to online learning, though not identical. The fact that we had Year 3 students to evaluate the revised module instead of Year 4 students, where the latter recommended most of the changes, helped us to gauge better students' needs and what an effective online module should comprise of. The FGDs suggest that an online module should incorporate several design features including: 1) Basic content knowledge; 2) quality visual and kinesthetic learning objects that allow interactivity; 3) higher order quiz items following the face to face lectures; 4) proper web navigation. The strength of this PUD module compared to lecture notes is that it is more 'visual' and structured, thus is easier to navigate.

Reflecting upon our experiences during the process of developing the online module, one of the most difficult challenges that we faced was the lack of technical support. Unless or until we are familiar with the platform going to be used in publishing the module, and the software and programs used to put 'things' together, we may not be able to present the learning materials in the most effective way that we aimed.

Getting students' voice during the learning design of the module essentially resulted in the learning design of the module taking a longer time to produce but resulted in this novel concept of involving students' expectation into the design process itself.

V. Conclusion

This study in learning design of pharmacotherapy e-learning module is a pioneering attempt to incorporate not only student engagement features but also student voices in the design of their own e-learning. FGDs have helped us to identify and ascertain essential features of e-learning module for the learning of pharmacotherapy and most importantly to collect students' views and expectations that were incorporated into the learning design of their own learning e-module. This was a novel learning design process of student-centred design of their own learning. The students' design components included effective multimedia, content that sufficiently addresses the learning outcomes, suitable active learning activity, and guided navigation. We are also bearing in mind that the design of an online module must not focus on serving certain groups of learners only, but it must cater for all the other types of learners as well.

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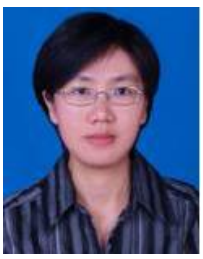

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