THE IMPACT OF STUDENT RESPONSE SYSTEM (SRS) IN ENHANCING NURSING STUDENTS’ ENGAGEMENT IN A LECTURE-BASED ENVIRONMENT: A MIXED-METHOD STUDY

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Abstract
Conducting a lecture is an effective and straightforward method of delivering information-rich knowledge to large class sizes. However, this kind of didactic teaching may hamper students’ engagement owing to the minimal interaction between lecturers and students. Student Response System (SRS) is supported to be one of the educational tools in enhancing students’ engagement in large class sizes. This study aimed to explore the impacts of SRS on the learning process in a lecture-based environment of undergraduate nursing students in Hong Kong. A mixed-method research design was adopted in this study. The Motivated Strategies for Learning Questionnaire (MSLQ) was administrated to two cohorts (n = 219) of first and second year undergraduate nursing students at the end of the school term to assess their motivational learning strategies. The first year students had minimal exposure to SRS use in lectures, whereas the second year students had the experiences of using SRS during their lecture-based learning environment. Independent t-test was adopted to compare MSLQ scores between these two cohorts of students. Seven students were then recruited in a focus group interview, in which, their perceptions of SRS in student engagement were explored. Content analysis was used for data analysis. Results of the MSLQ showed the overall mean MSLQ score of 198.70, indicating that students perceived themselves as being motivated in learning. No significant effect of SRS use existed to enhance engagement on MSLQ scores between the first and the second year undergraduate nursing students. Qualitative analysis showed that the perceived purposes of SRS reinforced the compliance of attendance and preparation for the examination. However, how SRS can enhance students’ engagement remained ambiguous from the students’ perspectives. In summary, different strategies were suggested to enhance students’ engagement with the use of SRS in the lecture-based environment. Examples are training lecturers on the use of SRS to facilitate student engagement and empowering students to be active learners with the support of SRS.

Keywords: Student response system, educational technologies, nursing education.

1 INTRODUCTION
Students’ perception of engagement and motivation to enhance knowledge and skill acquisition at the competent level are practical research issues that have concerned academics and educators in the higher education for decades [1]. These research issues have led to developing a wide range of educational technologies, to foster learning and application effectively in professional healthcare training [2], [3], [4]. However, these studies drew upon the enhancement of educational technologies at a convenient point of the learning process with a conclusion on enhancement. Given the limited views from literature, the findings tend to reveal the facilitation only in certain parts of learning. Therefore, considering students’ perspectives of technology-enhanced learning on its nature in a course is necessary.

Student Response System (SRS) is named as ‘clicks,’ ‘Audience Response Systems (ARS)’ and ‘Personal Response Systems (PRS),’ among different researchers [5]. The term ‘Student Response System (SRS)’ will be adopted in this study. The advancement of educational technology prompted the efficient implementation of SRS concurrently with less hardware required. SRS should be operated cooperatively by three key platforms, including (1) mobile phone device with the app; (2) the web-based programme on the instructor’s computer and (3) the central server [5]. SRS must register individual users before obtaining and delivering responses. Therefore, instructors and registered users can provide and obtain feedback on both individual and collective levels of the students’ overall performance [6].

Preis et al. [6] revealed that SRS permits instructors to ask routine questions in large class sizes, receive real-time responses from students and provide immediate feedback to students aligned with
learning outcomes. DeBourge [7] shifted the focus of lecture interaction from comprehension to higher cognition on application and analysis on the level of the questions posed via SRS. Furthermore, the questioning technique as an instructional strategy can prompt further discussion and promote preparation for a large class size [2],[3],[5],[7],[8],[9],[10],[11]. The findings from the reviewed studies showed that SRS facilitated students’ learning progress and motivated their engagement in lecture materials.

In summary, a lack of knowledge regarding technology-enhanced learning in a course-based situation exists. The current study has implemented SRS (one of the educational technologies) in a taught nursing course to assess its impact on the learning process of students. Subsequently, the findings of the proposed studies can contribute to the field of educational technologies in higher education in Hong Kong. The study aimed to (1) measure two cohort nursing students with the use of SRS in the lecture-based learning environment and (2) investigate students’ experiences regarding the use of SRS at the lecture-based learning environment.

2 METHODOLOGY

The current study followed an explorative mixed-method study design aimed at measuring the use of SRS; then, a focus group interview was conducted, thereby allowing further exploration of the issues [12]. Institutional Ethical Review Regarding Human Research approval was obtained before the start of the study.

2.1 Setting

The study was conducted in the school of nursing and health studies at a university in Hong Kong. Currently, nursing education has deployed various educational technologies to support teaching and learning in nursing theory and clinical practice. The school has been incorporating iPad into the clinical practicum and lectures to enhance learning for a large cohort of enrolled nursing students. Such features in the learning environment coupled with technologies and integrated course contents both have been implementing SRS since September 2015.

2.2 Participants

All enrolled first and second year undergraduate nursing students were recruited to participate in the study at the end of their taught nursing courses. An information sheet detailing the importance of the study was delivered with the questionnaire to two cohorts of nursing students. Moreover, the second year nursing student participants (n = 7) who volunteered in the focus group interview gave informed consent.

2.3 Instrument

The Motivated Strategies for Learning Questionnaire (MSLQ) was used to assess students’ different levels of motivation and strategy used at the course level [13]. It consists of 44 items constructed by two subscales, namely, motivational beliefs and self-regulated learning strategies. Each of the items is scored on a seven-point Likert scale, from 1 (not at all true of me) to 7 (very true of me). A maximum score of 308 indicated the strongest motivation with learning strategies performed, whereas a minimum score of 44 indicated that least motivation without learning strategies performed. Four items in the MSLQ were negatively worded, and the ratings for these items should have reversed before the summation of a total score. The negative Likert statements include ‘It is hard for me to decide what the main ideas are in what I read’, ‘When work is hard I either give up or study only the easy parts’, ‘I often find that I have been reading for class but don’t know what it is all about’ and ‘I find that when the teacher is talking I think of other things and don’t really listen to what is being said’.

The MSLQ has been used to assess the motivational and cognitive effects of educational technology, such as different types of multimedia designs and Internet-based instruction [14]. The internal consistency (Cronbach’s alpha) for MSLQ was .81 on average [13], [14]. Therefore, MSLQ is considered accurate and appropriate to measure educational technology, such as SRS impact on students’ motivational and cognitive effects, as the results could answer the first objective.
2.4 Focus Group Interview

A one-hour focus group interview was conducted using a semi-structured interview guide to explore students’ experiences of using SRS in a lecture-based learning environment. Focus group is well suited for identifying attitudes and experiences within a given context [15]. The investigator acted as a moderator to structure the group discussion based on the interview guide and to introduce topics, such as the perceived purpose of SRS and the experiences of using SRS in a lecture-based learning environment. The dialogues were audio-recorded and transcribed verbatim for analysis.

2.5 Data Analysis

SPSS–Version 22, was used for quantitative data analysis. Descriptive statistical methods were employed to summarise all study variables. Independent t-test assessed the difference in mean MSLQ scores between the first year and second year nursing students. All results were analysed using alpha as .05.

Qualitative data collected from the interview were analysed using the content analysis approach as described by Graneheim and Lundman [16]. This approach involves three phases: (1) meaning-unit identification, (2) condensation and (3) abstraction. Two investigators independently read the transcribed interview several times to obtain a sense of the whole. Each investigator identified the meaning units of the transcribed text and then condensed them into a description with proximity to the text, that is, the manifest content. The two investigators gathered to discuss how the manifest should be influenced, that is, the latent content. The two investigators reflected and reached a consensus on the latent context in which several themes were finally revealed.

3 RESULTS

A total of 219 out of 289 nursing students completed the questionnaire, and the response rate was 76%. The overall mean age of the participants was 18.8. Table 1 shows that the gender comprising the majority who had enrolled in the nursing programme was female (n = 175, 79.9%).

<table>
<thead>
<tr>
<th>Bachelor's degree in Nursing</th>
<th>Age</th>
<th>Male (n = 44)</th>
<th>Female (n = 175)</th>
<th>Overall (N = 219)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>18.5 (.9)</td>
<td>18.2 (.8)</td>
<td>18.3 (.8)</td>
</tr>
<tr>
<td>First Year</td>
<td></td>
<td>(n = 22)</td>
<td>(n = 108)</td>
<td>(n = 130)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20.6 (2.6)</td>
<td>19.3 (.8)</td>
<td>19.6 (1.6)</td>
</tr>
<tr>
<td>Second Year</td>
<td></td>
<td>(n = 22)</td>
<td>(n = 67)</td>
<td>(n = 89)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>19.5 (2.2)</td>
<td>18.6 (1.0)</td>
<td>18.8 (1.4)</td>
</tr>
</tbody>
</table>

3.1 Measurement of MSLQ

The overall mean MSLQ score for all participants was 198.7 (Table 2). Data in Table 2 also showed that no significant differences existed in the mean MSLQ scores (p > .05) between the first year and second year nursing student participants.
Table 2. Mean differences for MSLQ score for the 219 students.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Overall $(N = 219)$</th>
<th>First year students $(n = 130)$</th>
<th>Second year students $(n = 89)$</th>
<th>$t$ value $(df = 217)$</th>
<th>$p$ value (t-test)</th>
<th>Difference $(95% \text{ CI})$</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSLQ</td>
<td>198.7 (23.0)</td>
<td>196.3 (21.9)</td>
<td>202.1 (24.2)</td>
<td>-1.8</td>
<td>.07</td>
<td>-11.9 --.43</td>
</tr>
</tbody>
</table>

3.2 Themes for Qualitative Findings

Three themes had been explored, namely, (1) saving time to physically sign in the attendance record by logging in the SRS, (2) confirming the comprehension of the taught materials at lectures and (3) preparing an examination by putting together information from the lecture notes and SRS. The following sections elaborate the details of the themes.

3.2.1 Saving Time to Physically Sign Up in the Attendance Record by Logging in the SRS

All students stressed the importance of meeting the attendance requirement by the school. They reflected their past signing up experiences before their registration into the SRS in the first year, and they shared examples of before and after the SRS use at lectures:

That was when everyone was on time for the lectures; more than 300 people rushed to the stage at the same time to sign the attendance record. It's the opposite case last year…because I didn't get an iPad. When I was in the middle of the commotion, I went out. I took the paper, I signed it and I was in a mess.

Hey, an SRS exists, in fact, you guys... everyone wants to sign up... that's how all of us can simultaneously log in to SRS. The system is very convenient.

3.2.2 Confirming the Comprehension of the Taught Materials at Lectures

Although a few of the students claimed that they freely responded to multiple-choice questions (MCQs) via SRS, most of them reflected they certainly understood the taught material of the course via SRS. They gave positive feedback regarding the use of SRS at lectures as they can focus on the lessons:

I am listening to the lecturer. Sometimes, the lecture is going to be boring and sleepy. I suddenly have to do MCQs in a lecture. I am allowed to talk to the app and refresh my thought as well as confirm whether I understood or not.

Another student perceived that the similar MCQs might appear in the examination:

I think that not all the students treat SRS seriously, but I think it promotes a thorough understanding of the lessons, or a teacher may show the sample of MCQs for the examination. It serves as an opportunity to preview the format of MCQ in the examination.

3.2.3 Preparing an Examination by Putting Together Information from Lecture Notes and SRS

All students agreed that the advantage of using SRS is its capacity to facilitate the review and repeated conduct of MCQs for examination preparation provided that they had successfully logged in to SRS and attempted all MCQs within the pre-set time at lectures. However, logging in to SRS was time consuming, which was stressful for users because a few of the teachers set a limit for the completion time of the quizzes. If they could not finish the quiz, the system will never allow the user to review the answers to the MCQs.

I can seamlessly log in to SRS that seemed to improve my day. Accordingly, I may have responded to more than a dozen MCQs within a period. It’s awkward when I was waiting entry into the system. The app features a time limit that will stop my attempt in the quiz when time is up. The/ answers are generous. If you have ticked any responses during the quiz, even if it was the wrong answer, the system will return the correct answer. Thus, I feel very confident to provide random answers.

One student introduced an excellent example of the SRS used to inspire his or her learning strategies:
After a lecture talked about several brand new names of drugs; I was required to link them with the correct categories of drugs via SRS. The lecturer granted me clues on how to differentiate various drug brand names by their association with particular drug’s category in the revision of course materials.

4 DISCUSSION

One of the challenges of using SRS has not been evidenced by motivational orientation in active learning and improved cognitive learning outcomes [6], [17]. Although using SRS is a commonly adopted tool with the advancement of educational technology in teaching and learning application, the study showed no statistically significant differences in MSLQ scores between the first-year and second-year nursing students. Indeed, the MSLQ scores did not differ across the years with nursing students in advanced years exposing the extended period of SRS use in lectures than in junior students in the current study. The current study has adopted an explorative mixed-method study design [12] to clarify findings for less favourable motivations and learning strategies, which emerged from quantitative findings using a consequent qualitative finding on themes.

As the SRS is operated via three key platforms, including mobile phone device with the app, the web-based programme on the instructor’s computer and the central server [6], SRS must register individual users to provide an individual and collective levels of students’ overall performance in the current study. Therefore, the second-year nursing students perceived SRS is a practical learning tool, especially in the aspect of physically signing up in the attendance record to fulfil the attendance requirement of the School.

Apart from recording attendance in lectures, nursing students perceived that using SRS could confirm their comprehension of the lessons taught in the lectures rather than enhancing active learning by providing immediate feedback [10]. The qualitative findings of the study revealed that the SRS practice could not shift the focus of interaction from comprehension because an objective type of questions raised in the multiple discrete options was adopted only [2], [7], [9], [10]. The strategy of probing opinion questions with multiple discrete options (i.e. true/false, yes/no and Likert-type scales) via SRS could prompt discussions and provide students feedback or opinions relevant to the taught lessons [6], [17], [18], [19], [20].

Moreover, the practice of SRS seemed to induce unfavourable feedback for nursing students as they revealed that they must compete with time to attempt sample test questions. If they failed to complete all of MCQs thoroughly within the pre-set time, the SRS would prohibit them from accessing the respective MCQs and answers thereafter. The findings highlighted those students who showed less satisfactory and favourable responses when an instructor asked too many questions within a limited response time, whereas Sternberger [10] suggested that a maximum of four questions posed during each topic lecture series via SRS would be associated with students’ positive attitudes towards SRS use.

However, using SRS to practice sample test questions regularly with multiple discrete options was favourable for all nursing students who participated in the focus group interview. The use of objective-type questions with instructors’ immediate feedback, which was provided as an example by one of the student participants, could facilitate memory discrete drug categorisations associated with relevant brand names. Thus, the instructional effectiveness of regularly using SRS in lectures could engage students’ habitual reading, thinking and practice on how to study the respective course rather than passively obtaining information and memorising it for examination at the end of the course.

5 CONCLUSION

Nursing students perceived SRS as a practical tool rather than one of the motivational learning tools in the current study. The key instruction of SRS based questioning strategy is accommodating multiple discrete options; however, the accommodation can pose a limitation to record attendance effectively and practice sample test questions on comprehension or even recalling facts. In the study, an inspirational example of learning moments with the effective instructions via SRS was reflected by a student participant. With this view, key considerations to inform the educational practices towards SRS are suggested to train lecturers on the use of SRS and to empower students to be active learners with the sufficient instructions via SRS. 
ACKNOWLEDGEMENTS

The work described in this paper was fully supported by a grant from the Katie Shu Sui Pui Charitable Trust–Research and Publication Fund (KS 2018/1.1).

REFERENCES


