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EVALUATING THE INFLUENCE OF STUDENT RESPONSE SYSTEMS ON UNIVERSITY STUDENTS' LEARNING

KELLY P. L. TEE[1,*], PAULINE H. L. TEO[1], RATNESWARY RASIAH[2]

[1]School of Liberal Arts and Sciences, Taylor's University, Taylor's Lakeside Campus, No. 1 Jalan Taylor's, 47500, Subang Jaya, Selangor DE, Malaysia
[2]Taylor's Business School, Taylor's University, Taylor's Lakeside Campus, No. 1 Jalan Taylor's, 47500, Subang Jaya, Selangor Darul Ehsan, Malaysia
*Corresponding Authors: PeiLeng.Tee@taylors.edu.my

Abstract

Technology has certainly changed the paradigm of classroom teaching globally. This has led to educators in introducing and integrating creative and interactive technologies in their instruction such as Student Response System (SRS). The purpose of this paper is to investigate the effects of SRS on students' learning experience specifically on students' concentration, engagement, enjoyment and motivation. In the Descriptive Statistics analysis, it is found that the highest average score of 4.47 out of 5 reflected the statement that students loved answering questions in class using the SRS tools. The second highest average score of 4.46 was reflected in the statement that students wished that the Student Response System was used in other classes. The SRS system was also perceived to be a useful tool for learning (score of 4.45), as it made the lessons more engaging (score of 4.41). Students perceived that the SRS has improved their overall learning experience (score of 4.30), as it was fun and interesting (score of 4.33). It is interesting to note that the SRS system was evidently perceived to have allowed students to keep their focus on the topics (score of 4.25), as students found themselves enjoying the lessons more (score of 4.24) and gaining more knowledge (score of 4.22) after completing the SRS activities. Based on the Multiple Linear Regression Analysis, the R-Square value of 0.531 demonstrates that 53.1% of the variations in students' learning experience is explained by the variations in the independent variables (IVs). The F-Stat reveals that the model is valid with a good model fit. The regression results demonstrate the empirical evidence that SRS-Engagement, SRS-Enjoyment and SRS-Motivation are significant predictors of Students' Learning Experience, while SRS-Concentration is not a significant predictor. In conclusion, the SRS tools used in this study provided students with positive learning experience when the students' engagement, enjoyment and motivation increased. This indicated that the SRS tools were effective teaching innovation in inducing motivation as well as engagement.

Keywords: Learning experience, Motivation, Student response systems.

1. Introduction

Technology has certainly changed the paradigm of classroom teaching globally. Stickler et al. [1] believe that with the advent of the Internet, teaching and learning is gradually being replaced by technology. This is evident in the Malaysian Education Blueprint 2015-2025 (Higher Education) which stated that Shift 9: Globalised Online Learning highlighted the need for Higher Learning Institutions (HLIs) in Malaysia to gradually gear towards the full implementation of blended learning [2]. Blended learning incorporates both traditional face-to-face learning environment and e-learning approaches. Educators are now confronted with choosing suitable e-learning applications in order to engage students and provide meaningful learning experience in the blended learning environment [3]. This calls on for educators to introduce and integrate interactive technologies in their instruction.

One way to integrate interactive technologies in the classroom is through the use of Student Response System (SRS). SRS was initially introduced to the education industry in the mid-1900. Known widely as student response system, other terms for this technology include electronic voting system, audience response system, personal response system, and classroom response system [4]. The conventional SRS involves handheld devices commonly called "clickers", "key-pads", "handsets" or "zappers", which enables students to respond accordingly to questions posed by their lecturers [5]. Additionally, there are new electronic applications of SRS which are referred to as game-based Student Response System (GSRS) such as Kahoot!, Quizizz, and Socrative which transforms the classroom into a temporary game show [6]. Both SRS and GSRS have been widely used in different disciplines from biology, chemistry, communication, computer science, engineering, mathematics, nursing, philosophy, physics and more and it has yielded positive feedback [5, 7].

It is evident from past studies that SRS provides multiple benefits to a students' learning experience, from enhancing and facilitating students' learning to the co-production of learning. Although previous studies have investigated the use of SRS in lectures, more attention was dedicated to the engagement and motivation variables. There is an evident gap in studies exploring the impact of SRS on students' concentration and its influence on students' learning experience, especially in Malaysia. Hence, this study aims to investigate the effects of SRS on students' learning experience specifically on students' concentration, engagement, enjoyment and motivation in a higher learning institution in Malaysia.

2. Literature Review

Several studies on SRS have reported negative results from the use of SRS in class such as poor time management in class, the setting up procedure of the SRS, which is time-consuming, teachers who do not explain after the quiz and student motivation being merely temporary, only during the use of SRS in class [8-11]. Despite the challenges mentioned above, SRS continues to gain popularity.

This is mostly due to other studies on SRS that point to greater benefits in learning including improved grades [12] and reduced cultural differences amongst international students [13]. Caldwell [5], in his study on the use of clickers, in a mathematics module, found positive improvements in some students. The SRS

allowed students to participate actively, which in turn helped some students to do better in the subject while reducing the number of failures and dropouts from the module. As reported by Garet et al. [14], classes, which adopt more engagement, led to greater student attainment. It is thought that with higher engagement in class, students are more motivated and have better learning approaches, which will result in improved knowledge retention [5, 15, 16]. Other studies claim similar findings that SRS encourage active learning [17-19].

In addition, according to Dervan [20], SRS is an ideal tool to elicit instant feedback from students. Han and Finkelstein [21] explained that SRS such as clickers encourages students to get involve and take part in discussions with their classmates. In a study by Mc Loone and Brennan [22], it was reported that students were more open to providing feedback using SRS. This is attributed to the anonymity feature which gives students an avenue to provide responses without being afraid of answering incorrectly and consequently, embarrassing themselves among their peers. Findings from another study on an online Student Response System in Japan which found an increase in student learning, class participation, enjoyment and motivation among others, support this claim [23].

Furthermore, there are studies, which highlighted the 'fun' effect of SRS being used in classrooms. The participants in these studies noted that SRS use made the lessons more interesting and engaging [24, 25]. In general, it is found that when the students in these studies had exposure to SRS technology, they were not bored during the class, and these students attributed their high level of engagement to the use of SRS. In another study by Wang and Lieberoth [26], it is found that using game-based Student Response System affected the students significantly and positively impacted the classroom dynamics in terms of concentration, engagement, enjoyment and motivation. Furthermore, students were motivated through the use of a game-based response system (Kahoot!) and it was also reported that the students had a higher level of satisfaction and engagement compared to using a traditional non-gamified response system (Clickers), and paper-form formative assessment for a quiz in lectures [27].

3. Methodology

The present study implemented the survey approach, and the results were reported using a descriptive design and multiple linear regression analysis based on the quantitative data.

Quantitative data

The study involved a survey of 103 students' perception on the influence of Student Response System (SRS) tools on their learning experience. This study was conducted during the January 2018 academic semester in a pre-university module: English I, which was taught to semester 1 foundation students in a private institution of higher education. It was a five credit hours module, which covers the four fundamental English skills: reading comprehension, listening, speaking and writing skills to develop students' academic ability for tertiary studies. The class of 103 students met once weekly during lectures for one semester (14 weeks). The SRS tool (Kahoot/Quizizz/Socrative) was conducted post-lecture and the interactive multiple-choice quiz comprised of lecture content with approximately

10 to 15 items or questions. Each session lasted no more than 15 minutes to prevent the possibility of a wear-out effect.

To test the proposed hypotheses on the SRS-Learning Experience relationship, data was collected using a self-administered questionnaire-based survey to elicit information from students with regards to their perception of the influence of SRS activities on their learning abilities and experience. The survey contained 14 Likert type questions and the items were measured using a scale from 1 = strongly disagree to 5 = strongly agree (refer Fig. 1 for details). To test the hypothesis of this study, the Statistical Package for Social Sciences (SPSS) was employed. The results were summarised using descriptive statistics such as frequency distribution and mean scores. The other statistical analysis tools employed included correlations, reliability analysis, and multiple linear regressions.

98 students completed the surveys out of a total course enrollment of 103, yielding a 95% survey response rate. 51% of the respondents were females, while 49% were males, reflecting a somewhat equal gender composition. In terms of the ethnic composition, 61.2% were Chinese, 12.2% were Malays, 6.1% were Indians, while 20.4% were others (mainly foreign students).

4. Results and Discussion

The detailed specific feedback given by the students as shown in Fig. 1, clearly reveal that the Student Response System tools had proven to be extremely useful in enhancing their learning experience. The results demonstrate the significant role that SRS tools played in engaging students in the learning process, providing them with various scaffoldings that made it possible for them to understand academic concepts and learn better. The overall scores for all statements in the questionnaire were given an average score above 4 (out of 5), showing evidence that the SRS tools had a significantly positive impact (of above 80%) on students' learning experience as per their feedback as shown in Fig. 1.

The highest average score of 4.47 out of 5 reflected how much the students loved answering questions in class using the SRS tools comprising of Kahoot, Quizzizz and Socrative. The second highest average score of 4.46 was given by the students who wished that the Student Response System was used in other classes, once again reflecting the significant importance that students perceived the SRS system had on their learning, as they hoped for a more holistic implementation of the SRS system across the other modules in their study programme.

The SRS system was also perceived to be a useful tool for learning (score of 4.45), as it made the lessons more engaging (score of 4.41). Students perceived the SRS system to have improved their overall learning experience (score of 4.30), as it was fun and interesting (score of 4.33). It is interesting to note that the SRS system was evidently perceived to have helped students to keep their focus on the topics (score of 4.25), as students found themselves enjoying the lessons more (score of 4.24) and gaining more knowledge (score of 4.22) after completing the SRS activities. This is a significant finding, as it reveals how effective the SRS tools are in promoting intentional learning among students. Such tools must be used in classes more often and for more modules in a holistic manner across universities and schools, in an effort to promote student engagement and enhance learning experience.

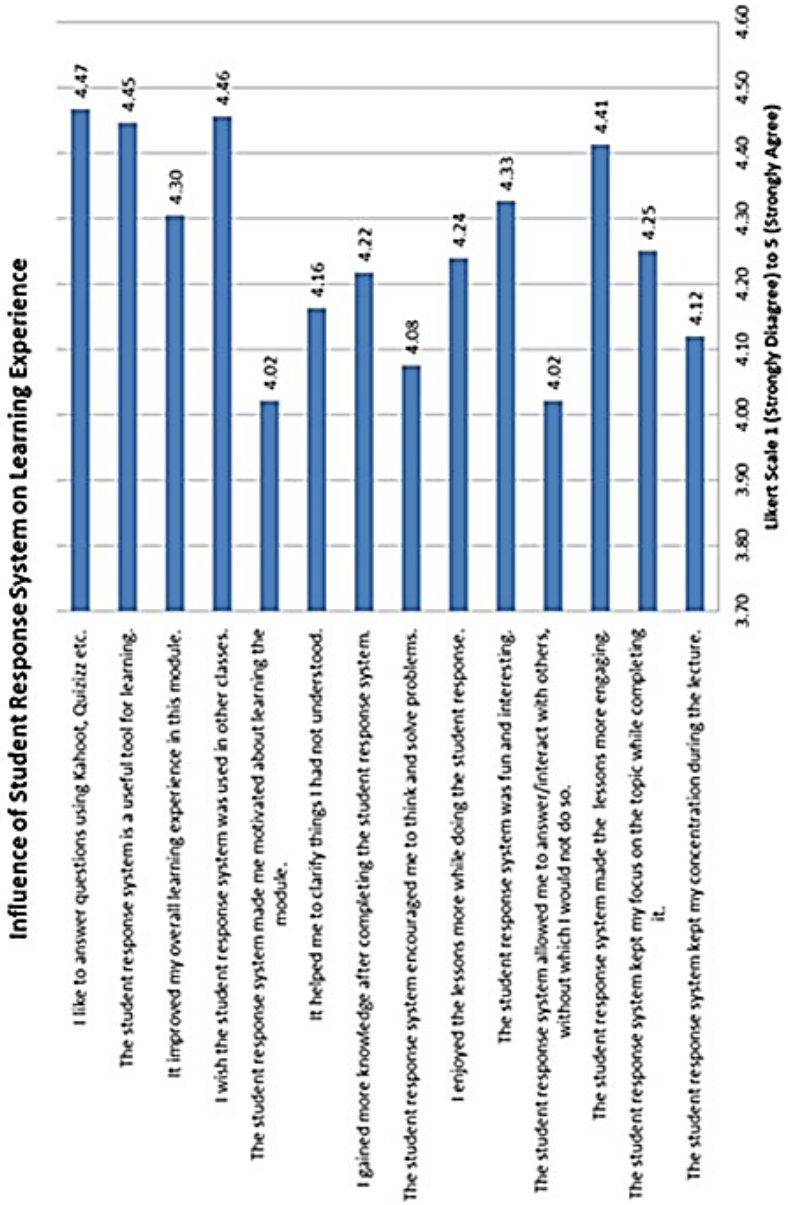

Fig. 1. Influence of Student Response System on learning experience.

4.1. Reliability analysis

In order to carry out further data analysis, it is important to conduct reliability test on the independent and dependent constructs to ensure item validity. Table 1 shows that all construct are reliable as their Cronbach alpha's are above 0.7 as per the requirement in statistical analysis [28]. With the evidence provided by the reliable test, we are now able to confidently proceed to conduct the Multiple Linear Regression analysis.

Table 1. Reliability analysis.

Research Construct	Type of Variable	Cronbach Alpha	Status of Reliability
SRS-Concentration (SRSC)	IV	0.901	Reliable
SRS-Engagement (SRSEG)	IV	0.760	Reliable
SRS-Enjoyment (SRSEJ)	IV	0.873	Reliable
SRS-Motivation (SRSM)	IV	0.760	Reliable
Student Learning Experience (SLE)	DV	0.763	Reliable

4.2. Multiple linear regression analysis

The results of the Multiple Linear Regression are shown in Table 2. The results reflect the good fit of the model used in this study.

Table 2. Multiple linear regression output.

Dependent variable: Learning experience (SLE)					
Model	**Unstandardized coefficients**		**Standardized coefficients**	**t**	**Sig.**
	B	**Std. Error**	**Beta**		
(Constant)	1.165	0.339		3.439	0.001
SRSC (Concentration)	0.072	0.074	0.093	0.977	0.331
SRSEG (Engagement)	0.264	0.100	0.245	2.646	0.010
SRSEJ (Enjoyment)	0.129	0.071	0.175	1.811	0.073
SRSM (Motivation)	0.277	0.071	0.375	3.923	0.000
R Square = 0.531			**F-Stat = 26.342**		
Adjusted R Square = 0.511			**(p-value = 0.000)**		

R-Square value of 0.531 demonstrates that 53.1% of the variations in students' learning experience is explained by the variations in the independent variables (IVs). The F-Stat reveals that the model is valid with a good model fit. The regression results shown in Table 2 demonstrate the empirical evidence that SRS-Engagement, SRS-Enjoyment and SRS-Motivation are significant predictors of Students' Learning Experience, while SRS-Concentration is not a significant predictor. The results show that when SRS-Engagement increases by one unit, students' learning experience increases by 0.264 units. On the other hand, when SRS-Enjoyment increases by one unit, students' learning experience increases by 0.129 units. It is interesting to note that the most significant and greatest impact on students' learning experience was caused by the motivation resulting from using SRS tools in learning (reflected by the construct SRS-Motivation). Surprisingly, the results show that the students' perceived concentration when using SRS tools (reflected by the construct SRS Concentration) does not explain students' learning experience.

4.3. Discussion

This study aimed to evaluate the effects of SRS on students' learning experience namely on concentration, engagement, enjoyment and motivation. The results indicated that SRS tools used in this study provided students with a positive learning experience as seen in the increased in students' engagement, enjoyment and motivation. This is in line with past studies from Mork [23], Wang and Lieberoth [26], Wang et al. [27] and Chaiyo and Nokham [29], that game-based student response systems such as Kahoot and Quizizz impacted students' learning positively and increased their engagement, enjoyment and motivation. Additionally, according to Wang et al. [27] study, SRS encourages motivation and facilitates engagement, in which, supported the SRS tools and encouraged motivation among students. Moreover, the students enjoyed their lessons through the use of SRS due to the 'fun' effect which made the lessons more interesting and engaging [24, 25] as they wished that the Student Response System was used in other classes, which achieved the second highest average score in this study. However, it was found in this study that student concentration's was not impacted by the use of SRS as compared to the past studies [26, 27, 29].

5. Conclusions

In conclusion, students reported a positive perception on their learning experience with SRS tools. These key findings offer significant insights into the effectiveness of using SRS tools in higher education and it can be considered as a promising and interactive technological tool in the implementation of active learning classrooms. It is strongly recommended that SRS tools namely game-based student response tools to be used in classes as it enhances learning experience. Additionally, the SRS tools improved students' motivation in class and it also increased student engagement in the learning process, which leads to collaborative learning.

An obvious limitation of this study is the nature of the research, which is not experimental. Therefore, a possible recommendation is for future studies to compare two different groups of students: students who use SRS tools and non-users of SRS tools on their learning experience. It is further recommended that future research in this area be more qualitative in order to have a more thorough understanding of the benefits of using game-based student response system. The qualitative study will also be beneficial in providing reasons as to why the use of SRS did not have a positive impact on students' concentration as found in this study or vice-versa.

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