Quick Response (QR) Codes Utilization on Improving Nursing Students' Engagement, Satisfaction and Perceived Learning in Damanhour University

Lucy Ahmed AbuElEla⁽¹⁾, Sally Abd El hamid Fayed⁽²⁾

(1,2) Nursing Education Department, Faculty of Nursing, University of Damanhour, Egypt

Abstract

Uses of quick response in Nursing education is increasing as it has great potential to improve teaching and learning through enabling students across multiple contexts, social and content interactions. Today technology is evolving more rapidly than ever. The younger generations, including nursing students, live their daily lives equipped with extremely advanced smart phone technology, thus, it is challenging nursing educators to integrate smart phone technology in education to increase the level of involvement. One of the most significant determinants of students' progress is their participation in academic-related learning activities. This happens through increasing students' engagement, satisfaction, and perceived learning. Aim of the study was to investigate the effect of quick response codes utilization on improving nursing students' engagement, satisfaction, and perceived learning. Method: A quasi -experimental method was utilized. The study was conducted at Faculty of Nursing Damanhour University, Egypt. Purposeful sample, 274 fourth academic year nursing students, the students randomly selected by a systematic random sample and divided into two identical groups study and control group / 137 each. The study was done during the academic year (2019-2020). One tool was used: The Effects of Student Engagement, Student Satisfaction, and Perceived Learning in Online Learning Environments to determine if a student experience satisfied or unsatisfied regarding their engagement and satisfaction toward using quick response in nursing education. Results: The study reveals that statistically significant positive intermediate correlations were found between different studied dimensions (Course Structure/Organization, Learner Interaction, Student Engagement, Instructor Presence, Student Satisfaction student, Perceived Learning,). However, negative correlation was found in learning interaction. statistically significant difference was found regarding students' engagement, satisfaction, and instructors' presence. Conclusion: Based on the results of the current study, the study was concluded that, using of quick response codes as a learning tool can improve students' engagement, satisfaction, and perceived learning. Recommendations: Applying training program for increasing awareness of all faculty members toward digital technologies and the diversity of context. Provision of quick response using courses in nursing education is recommended.

Keywords: quick response technology, nursing students' engagement, satisfaction, and perception.

Introduction

Quick Response (QR) is an application that allows scan patterned 2D squares to obtain fast access to information (Jupiter, 2011; Shin, Jung, & Chang, 2012). QR codes can potentially add value to learning activities by encouraging nursing students to create and share learning content, engage with different learning needs, and facilitate learning inside and outside the classroom (Chen et al., 2010; Crompton, et al., 2012; Sampson, 2012; Yusof, et al., 2012; Pérez-Sanagustín, et al., 2016).

QR codes has evolved from the traditional bar code which was used originally for vehicle parts inventory tracking or control in auto smartphone manufacturing (Rouillard 2008; **Pillai et al. 2017),** but currently it contains more information. Codes information can be read by taking a picture of the QR codes using the smart phone, and users can access the internet via QR codes by reading a web address to get more information on a product or service. The technology was predominantly used in the service industry such as food services, transport, entertainment industry, hospitality, tourism, and financial services, etc. (**Pillai et al. 2017**).

Hence, QR codes have become an appealing technology, but the initial concern was how teachers could utilize this tool creatively to create more interactive and student-centered learning environment that promotes collaboration among students each other and with teachers especially in the large classroom (Brooks 2016).

Higher education institutions have recognized the importance of developing and maintaining effective infrastructural systems to encourage learner persistence shifting to online learning which is facilitated by using Web 2 tools. It's worth mention that QR is one of Web 2 tools (Milman, Posey, Pintz, Wright, & Zhou, 2015, Pérez-Sanagustín et al. 2016).

This shift to online learning requires that institutions review their curriculum and strategies so that curricular designs accommodate learner diversity and learner needs in the online environment to stimulate students' engagement (Sun & Chen, 2016; Judge & Murray, 2017; Stocker, 2018). Cox and Cox (2008) posited that providing a collaborative learning environment is an essential component of online learning platforms because it fosters relationships and a sense of community among instructors and learners. Ghasemi, et al (2020) further asserted that this sense of community positively impacts student engagement and student satisfaction levels.

It is required to design these systems in order to satisfy the needs of learners while ensuring that students apply self-regulation skills and remain engaged in the learning process to succeed (Cho & Shen, 2013; Mello, 2016). Student engagement defined as how involved students are in their learning experience and how connected they feel to their classes, peers, and their institutions (Axelson and Flick 2010).

Given the positive associations between engagement, course student satisfaction. persistence, and academic success, initiatives aimed at fostering student engagement in classrooms have become a primary focus for higher education institutions. As more and more technology becomes integrated into the student learning experience, educators have begun to explore technology-based initiatives as a means to enhance student engagement and perceived learning through facilitating active learning activities (D'Inverno, Davis, and White 2003; Carini, Kuh, and Klein 2006; Poirier and Feldman 2007; Kuh et al. 2008; Wefald and Downey 2009; Blasco-Arcas et al. 2013).

Furthermore, recent reports have found that students are requesting classes to integrate more technology. Students believe that technology enriches their academic experience and is critical for students' engagement, satisfaction and perceived learning (Dahlstrom and Bichsel 2014, Brooks 2016). However, despite traditional education, computers and technology becoming an integral part of delivering education.

Moreover, Karia et al (2019), found that the use of OR codes in nursing education increase students' engagement and facilitate administrative tasks in training. In addition, they found that there positive perceptions towards using QR codes in education. OR codes can potentially add value to learning activities by encouraging students to create and share learning content, engage students with different learning needs, and satisfy learner inside and outside the classroom (Crompton, LaFrance, & van't Hoof, 2012; Sampson, 2012; Yusof, etal., 2012; Pérez-Sanagustín, etal., 2016). The finding of other studies suggests that, in order to maximize its educational benefits, QR codes activities should be planned for both inside and outside the classroom as exemplified by (Lee et al., 2011; and Pérez-Sanagustín et al., 2016).

Significance of the Study:

Despite their potential benefits, OR codes are still in their early stages of use in educational contexts, there is a clear need for more research examining the integration of QR codes in higher education (Gradel & Edson, 2012; Albastroiu & Felea, 2015). This observation urges researchers to conduct further studies to investigate how QR codes can be integrated in leaning activities and inform practice (Abdol Latif, Fadzil, Munira, & San, 2012). Moreover, Nur (2020) stated that QR codes provide easily access to contents by using mobile phones which increase students' motivation and their eager to learn. Thus, engagement, satisfaction students' and perceived learning could be increased through using online tools as QR codes as an important contributing factor towards the development of such issues.

Aim of the study:

The study aimed to:

To investigate the effect of QR codes utilization on improving nursing students' engagement, satisfaction, and perceived learning in Damanhour University.

Research hypothesis

The use of QR code will increase nursing students' engagement, satisfaction, and perceived learning.

Research Design:

A quasi-experimental research design was used to conduct this study.

Setting:

The study was carried out in the Faculty of Nursing, Damanhour University. The faculty has nine different scientific nursing departments: Medical-Surgical, Critical care and Emergency, Obstetrics and Gynycology, Pediatrics, Community, Geriatric, Psychiatric, Administration and Education. The last mentioned four department students taught research in first term and they enrolled in the fourth year. Each term is consisting of 15 weeks.

Subjects and Methods

Subjects:

Purposeful sample, 274 fourth academic year nursing students regardless their characteristics, the students randomly selected by a systematic random sample and divided into two identical groups (137 student as a study group) and (137 as a control group). The study was done during the first term of academic year (2019-2020). The study group used QR codes, while the control group learns with traditional teaching strategies.

Tool of the study:

"The Student Learning and Satisfaction in Online Learning Environments Instrument (SLS-OLE)" was adopted after reviewing an existing instrument as well as numerous studies about online learning environments, student engagement, satisfaction, and learning, instructor presence, and learner interaction. It was translated into Arabic by the researchers. It was developed by **Gray**, **J.**, **& DiLoreto**, **M.** (2016) to determine if a student experiences high, moderate, or low level of their engagement and satisfaction toward using QR in nursing education. It consists of 34 statements comprised **of six dimensions:** feedback statements on a 6 likert scale responses; 1 = Strongly Disagree (SD), 2 = Mostly Disagree (MD) 3 = Slightly Agree (SA), 4 = Moderately Agree (MA), 5 = Mostly Agree (MOA), 6 = Strongly Agree (SA)

Reverse scores were allotted to statement number 2,7,17,19, 25 and 31.

The Six dimensions are:

- Dimensionone:CourseStructure/Organization; 5 statements on
course data; student learning outcomes
aligned to learning activities, learning
outcomes Course navigation, layout,
student participation, and the purpose of
the course. Dimension two: 7 statements
on Learner Interaction; frequency,
opportunities for active learning, learning
activities, opportunities, frequency
of communication opportunities, frequency
of communication with instructor, and
received ongoing instructions.
- **Dimension three:** 5 statements on Student Engagement: frequently interaction with instructor, discussion of learned outside course, completed assigned readings, participated in synchronous and/or asynchronous chat, actively engaged in activities.
- **Dimension four: 5** statements on **Instructor Presence:** instructor's feedback on assignments clarity, constructive, timely, instructor care about progress, and learned from the feedback.
- **Dimension five: 6** statements **Student Satisfaction student:** satisfaction, recommending this course, satisfied with the level of student interaction, satisfied with learning, satisfied with the instructor, and satisfied with the content.
- **Dimension six: 6** statements **Perceived Learning:** pleased with what I learned, learning tasks enhanced, learned less in the course than anticipated, learned skills that will help in the future, learning activities promoted, and course contributed to professional development.

Scoring system:

| Domains | No. of Items | Score | Unsatisfied | Satisfied |
|---------------------------------------|-----------------|----------|-------------|-----------|
| Course Structure/ Organization | 5 | 5-30 | 5-23 | 24 - 30 |
| Learner Interaction | 7 | 7 - 42 | 7 – 33 | 34 - 42 |
| Student Engagement | 5 | 5-30 | 5 – 23 | 24 - 30 |
| Instructor Presence | 5 | 5-30 | 5 – 23 | 24 - 30 |
| Student Satisfaction | 6 | 6-36 | 6 - 28 | 29 - 36 |
| Perceived Learning | 6 | 6-36 | 6 - 28 | 29 - 36 |
| Overall | 34 | 34 - 204 | 34 - 161 | 162 - 204 |

Method:

- Approval from Faculty of Nursing dean -Damanhour University was obtained to carry out the study.
- Approval from ethical committee of Nursing Damanhour University was obtained to carry out the study.
- Meetings were held with the head of concerned nursing Departments to clarify the purpose of the study and to gain the cooperation and support during data collection.
- Tool was adopted by the researchers after reviewing the recent relevant literature.
- Tool was translated into Arabic to suits all students.
- Content validity for tool was established by jury of five experts from Nursing Education Department. Accordingly necessary modifications were done.
- Tool was tested for their reliability using Cronbach's alpha. The values were revealed as follow **Course Structure/Organization** (0.807), **Learner Interaction** in QR (0.843), **Student Engagement** in QR (0.773), **Instructor Presence** (0.821), **Student Satisfaction** in adopting QR (0.811), **Perceived Learning** in adopting QR (0.898) and overall reliability (0.960).

Pilot study:

Pilot study was conducted on 28 (10 %) of students and they were excluded from the total number of students to insure the clarity and comprehensiveness of the tool.

Process of application:

Field work:

- The research course was introduced to both groups face to face, but the study group was using QR codes (online activities) to navigate the assignments, videos and websites related to research course.

<u>QR structure and Learning activities:</u>

- Along 6 weeks in-class QR codes activities were integrated into the curriculum of the course undertaken by students.
- To increase students' engagement, and satisfaction, six QR codes activities were created and implemented by the researchers to help students review, engage, and reflect on the videos and websites learning contents of six topics of research curriculum.
- In terms of the instructional procedure, the students were first given instructions and guidance regarding the basic requirements on how to use QR code in class. They first needed a smartphone; install a QR code reader, and their device must be connected to the internet.
- Each QR code was printed in students' handout to be accessible any time anywhere.
- In addition, the researcher projected the designated QR code sheet on the projector screen. The QR code sheets provided immediate access to the learning resources related to the curriculum activities.
- These were linked to YouTube videos and webpages considering students' preferences in order to facilitate online learning.

| Zit activities distribution during | SIA WEEKS. | - |
|------------------------------------|--------------------------------------|---------|
| Week | QR Activities | QR code |
| First week | Research process | |
| Second week | Theoretical Frameworks | |
| Third week | Research Design | |
| Fourth week | Sampling | |
| Fifth week | Tools and Methods of Data Collection | |
| sixth week | Analyzing the data | |

QR activities distribution during six weeks:

- Data were collected from both groups through self- administered questionnaires that were distributed among the 4th academic year nursing students 2019-2020 during the first term after six weeks of QR usage.
- Each student consumed a period around 25 minutes to fill out the questionnaire sheet.

Ethical Considerations:

- All students were informed about the purpose of the study and given brief explanation; consequently, written informed consent was obtained from each of them.
- The right to refuse to participate or withdraw from the study was emphasized after reassuring students that their response would have no impact on their grades.
- Data Anonymity and confidentiality were considered.

Statistical Analysis:

Statistical analysis of the data

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0.

Data were described using mean, standard deviation. Significance of the obtained results was judged at the 5% level.

The used tests were

1 - Chi-square test

For categorical variables, to compare between different groups

2 - Student t-test

For normally distributed quantitative variables, to compare between two studied groups

3 - Pearson coefficient

To correlate between two normally distributed quantitative variables

4 – Cronbach's Alpha

Reliability Statistics was assessed using Cronbach's Alpha test.

Results

Table (1): Illustrated that 51.8% of studygroup aged less than 21 years compared to 46.7%

 χ^2 : Chi square test

of the control group with a mean of age 20.47 ± 1.34 for study group and 20.63 ± 1.33 for control group. Considering residence about 30% of both study and control groups were from rural areas and 68.6% of study group are from urban. More than 80% of both groups had no training about e-learning.

Table (2) and Figure (1): Shows that there was a significant difference at all dimensions of students' engagement, students' satisfaction, and perceived learning in online learning environments of the both groups with P=0.001.

Table (3):ShowsCorrelationmatrixbetween the engagement, satisfaction and

perceived learning in study group as it was found that, a significant positive correlation between different study groups.

Table (4): reveals the relationship between the QR use in education and their sociodemographic characteristics at post phase of the study, it was found that there a statistically significant difference regarding all domains except gender and residence with learning interaction in addition to residence with course structure, students' engagement, and perceived learning.

*: Statistically significant at $p \le 0.05$

| Characteristics | Contro (N= | Control group (N=137) Study g (N=13 | | group 137) | Test of sig. | р |
|-----------------------------------|---------------|---|-------|---------------|------------------|-------|
| | Ν | % | N | % | _ | - |
| Age | | | | | | |
| 19 - <21 | 64 | 46.7 | 71 | 51.8 | $x^2 = 0.715$ | 0.208 |
| 21 - 23 | 73 | 53.3 | 66 | 48.52 | $\chi^2 = 0.713$ | 0.398 |
| Mean ± SD | 20.63 | ±1.33 | 20.47 | ±1.34 | t = 0.996 | 0.320 |
| Gender | | | | | | |
| Male | 23 | 16.8 | 30 | 21.9 | $x^2 = 1.146$ | 0.284 |
| Female | 114 | 83.2 | 107 | 78.1 | $\chi = 1.140$ | 0.264 |
| Residence | | | | | | |
| Rural | 41 | 29.9 | 43 | 31.4 | $w^2 = 0.060$ | 0.703 |
| Urban | 96 | 70.1 | 94 | 68.6 | χ = 0.009 | 0.793 |
| Training courses about E-learning | | | | | | |
| Yes | 22 | 16.1 | 21 | 15.3 | $x^2 = 0.028$ | 0.868 |
| No | 115 | 83.9 | 116 | 84.7 | $\chi^2 = 0.028$ | 0.808 |

Table (1): Socio-demographic characteristics for control and study groups

t: Student t-test

| Table (2): Difference between | Students' | Engagement, | Satisfaction, | and Perceived | Learning | during u | using | QR |
|-------------------------------|-----------|-------------|---------------|---------------|----------|----------|-------|----|
| Codes | | | | | | | | |

| Domains | Control group (N=137) | Study group (N=137) | t | р |
|--------------------------------|-------------------------------|------------------------|---------|---------|
| Course Structure/ Organization | | | | |
| Total score | 13.18 ± 5.06 | 17.67 ± 2.96 | 8 070* | <0.001* |
| % score | 45.88 ± 25.31 | 68.36 ± 14.78 | 0.979 | <0.001 |
| Learner Interaction | | | | |
| Total score | 22.32 ± 8.29 | 32.15 ± 5.94 | 11 200* | <0.001* |
| % score | 43.77 ± 23.67 | 71.87 ± 16.96 | 11.290 | <0.001 |
| Student Engagement | | | | |
| Total score | 15.22 ± 5.83 | 22.79 ± 4.27 | 10.002* | <0.001* |
| % score | 40.88 ± 23.30 | 71.15 ± 17.09 | 12.205 | <0.001 |
| Instructor Presence | | | | |
| Total score | 16.52 ± 6.50 | 22.45 ± 3.84 | 0.101* | <0.001* |
| % score | 46.07 ± 25.98 | 69.78 ± 15.38 | 9.191 | < 0.001 |
| Student Satisfaction | | | | |
| Total score | 19.90 ± 7.15 | 26.80 ± 5.51 | P 044* | <0.001* |
| % score | 46.33 ± 23.84 | 69.32 ± 18.37 | 8.944 | <0.001 |
| Perceived Learning | | | | |
| Total score | 19.34 ± 7.61 | 27.31 ± 5.13 | 10.152* | <0.001* |
| % score | 44.48 ± 25.38 | 71.02 ± 17.10 | 10.155 | <0.001 |
| Overall | | | | |
| Total score | 106.47±35.45 | 149.16±25.54 | 11 425* | <0.001* |
| % score | $44.53{\pm}21.49$ | 70.40±15.48 | 11.435 | <0.001 |
| t: Student t-test *: Statist | ically significant at $n < 0$ | 05 | | |

Figure (1): Difference between Students' Engagement, Satisfaction, and Perceived Learning during using QR Codes



Table (3): Correlation matrix between different dimensions within study group

| dimensions | | Course Structure/ Organization | Learner Interaction | Student Engagement | Instructor Presence | Student Satisfaction | Perceived Learning |
|--------------|---|--------------------------------------|------------------------|-----------------------|------------------------|-------------------------|-----------------------|
| Learner | r | 0.825* | | | | | |
| Interaction | р | < 0.001* | | | | | |
| Student | r | 0.787^{*} | 0.855^{*} | | | | |
| Engagement | р | < 0.001* | $< 0.001^{*}$ | | | | |
| Instructor | r | 0.831* | 0.786^{*} | 0.842* | | | |
| Presence | р | < 0.001* | $< 0.001^{*}$ | < 0.001* | | | |
| Student | r | 0.766^{*} | 0.817^{*} | 0.807^{*} | 0.746^{*} | | |
| Satisfaction | р | < 0.001* | $< 0.001^{*}$ | < 0.001* | < 0.001* | | |
| Perceived | r | 0.758^{*} | 0.820^{*} | 0.838* | 0.805^{*} | 0.961* | |
| Learning | р | < 0.001* | $< 0.001^{*}$ | < 0.001* | < 0.001* | < 0.001* | |
| Overall | r | 0.882* | 0.931* | 0.927* | 0.893* | 0.935* | 0.948* |
| Overall | р | < 0.001* | $< 0.001^{*}$ | < 0.001* | $< 0.001^{*}$ | < 0.001* | < 0.001* |

r: Pearson coefficient

*: Statistically significant at $p \le 0.05$

| % score | Course Structure/ Organization | Learner Interaction | Student Engagement | Instructor Presence | Student Satisfaction | Perceived Learning | Overall |
|-----------|--------------------------------------|------------------------|-----------------------|------------------------|-------------------------|-----------------------|--------------------|
| Age | | | | | | | |
| 19 - <21 | $40.47{\pm}24.39$ | 39.24± 22.31 | $36.06{\pm}23.74$ | 40.19± 25.45 | 41.56 ± 23.60 | 38.96± 24.22 | 39.42± 21.49 |
| 21 - 23 | $50.62{\pm}25.30$ | 47.75 ± 24.26 | 45.10± 22.22 | 51.23± 25.51 | 50.50± 23.41 | 49.32± 25.55 | 49.01± 20.60 |
| t(p) | 2.382* (0.019*) | 2.126* (0.035*) | 2.299* (0.023*) | 2.531* (0.013*) | 2.222* (0.028*) | 2.425* (0.017*) | 2.663* (0.009*) |
| Gender | | | | | | | |
| Male | $34.35{\pm}20.80$ | 35.53 ± 19.30 | $27.48{\pm}27.48$ | 29.57±18.71 | 33.04±18.34 | 30.58±18.77 | 31.91±15.78 |
| Female | $48.20{\pm}\ 25.57$ | 45.44± 24.19 | $43.58{\pm}23.34$ | 49.40±26.03 | 49.01±23.98 | 47.28±25.68 | 47.08±21.64 |
| t(p) | 2.438* (0.016*) | 1.848 (0.067) | 3.118* (0.002*) | 4.312* (<0.001*) | 3.016* (0.003*) | 3.636* (0.001*) | 3.190* (0.002*) |
| Residence | | | | | | | |
| Rural | 39.39±22.48 | 38.75±19.18 | 35.71±21.51 | 36.88±21.90 | 39.59±19.84 | 38.70±20.91 | 38.23±17.92 |
| Urban | 48.65±26.04 | 45.92±25.14 | 43.08±23.79 | 50.0±26.69 | 49.20±24.90 | 46.94±26.79 | 47.22±22.39 |
| t(p) | 1.980(0.051) | 1.820(0.072) | 1.709(0.090) | 3.001* (0.003*) | 2.398* (0.018*) | 1.936 (0.056) | 2.490* (0.015*) |

 Table (4): Relation between Socio-demographic characteristics and Using QR codes on Different dimensions among study group

t: Student t-test *: Statistically significant at $p \le 0.05$

Discussion

Today nursing education and different learning systems have various challenges and changed from traditional teaching to electronic (E)learning and technology-based training. Higher education is trying to involve smartphones, i-pads, tablets. and other applications to promote education and improve student engagement. Manv educational organizations have successfully implemented the QR Codes for undergraduate students to replace handouts and offer additional methods to support their learning (Muir, 2020).

The results of this study are worth examining from two points. The first point is the comparison of students' perceived learning regarding using QR codes in nursing education and the second point is comparing students' engagement and satisfaction level which changed to a higher level after using smartphone applications in learning process instructions.

All the respondents of the present study were enrolled in research course-fourth year study; they were 53 male participants and 221 females indicating that female participants were more male with mean age (20.47 ± 1.34) and more than half resident in urban area. In addition, **Rabu**, **Hussien**, **& Bervell**, **2018** reported that their participants were aged of 21–23 years and the female were more than male students. Moreover, **Abdel-Salam 2018** stated that here study participants were aged of 20-22 years and the female were majority, but in contrast with the present study, less than three quarters of the study and control groups were resided in rural area. In this essence **Harerimana, A., & Mtshali, 2019** reported in their study that their participants were from undergraduate and postgraduate students.

The findings of the present study revealed that there is significant difference among students regarding course structure, learning students' engagement, interaction. and instructor presence during using QR codes in classroom. This can be explained as the students today are from millennial Generation and they have ability to assimilate the new technology faster. In addition to, the organized structure of the course parts and activities in logical sequence and clear instructions about students using the designed QR codes facilitate the learning process and increased students' engagement as they may be motivated by QR codes as new learning tool.

The results of the current study revealed that highly significant positive correlations existed between using QR codes students' engagement, satisfaction, and perceived learning. This may be explained that students are interested in technology usage. In addition to, they are from millennial generation who are interested in using technology. This attracts toward research course topics. Through which they can navigate in the applications and clarifies various research course topics in nursing education discipline.

This is in accordance with **Abd El Rahman** and Fayed (2019) who found that there is highly correlation significant existed between the Web 2.0 tools (which QR is one of them) acceptance and learning activities and content interaction. In addition, Lin and Teng 2018 concluded that their participants stated that QR codes increase their course engagement through asking questions and searching different websites.

In addition to, **Zurmehly (2017)** who concluded that his study participants were satisfied with the use of QR codes and appreciated the immediate feedback and plan to use it in the clinical setting, they reported that QR codes is good for integrating technology into the classroom to provide students with instant positive feedback. Meanwhile, **Mogali et al.**, **2019** stated that more than three quarters of their participants were satisfied with using QR codes in learning as it encourages them to be engaged in courses.

Also, the current results supported by **De Pietro, and Fronter, (2012),** as they found that using QR in learning have positive effect on students' learning in medical sciences courses. In addition, **Guo, et al. (2015),** stated that the integration of mobile technologies in nursing education provide opportunities for students to actively engaged and participate in different learning at any time or any location. This participation provides potential to increase student achievement and focus their attention on the context of the learning environment.

The findings also stated that highly significant differences were found between total studied nursing students' who use QR codes as learning tool and demographic characteristics: age, gender, and residence and their engagement, satisfaction, and perceived learning. This may be contributed to their age as young adults' generation with impeding technology usage, as they adapt to technology and learn faster more than older adults because they started it much earlier. Students also reported that it was much easier for them to learn on their own and it was funny to use another learning tool as OR codes. This also, may be due to it helped them to learn nursing research course effectively and clarified the inter-relationships and applicability among curriculum contents. They also have the chance to access learning or course instructions at any place either urban or rural, through any device, as smart phones, tablet, personal computer,...etc. In this essence Abd El Rahman and Fayed (2019) stated that students using Web 2.0 tools which OR code one of them were satisfied with the application of web 2.0 tools in learning activities.

Moreover, **Jabbour**, **(2014)**, indicates that, the participants had a positive attitude toward the use of mobile devices with QR code in learning. Also, the regular use of mobile technology improved their satisfaction and comfort level in using technology. The use of QR code in the classroom influence participants' motivation to learn and achievements.

Also, this was in line with Lee and Park (2018), who found that nursing students had an improvement in their skills, engaging in learning strategies and activities, self-evaluation, and aware of self-needs despite their demographic characteristics. Park and Park (2017) also stated that students, who use Web 2.0 via smart phones had greater improvement in their learning abilities. In contrast, Zakaria et al. (2010) indicated that young students have significant unawareness with certain Web 2.0 technologies, such as social tagging and bookmarking. On the other hand, Ulrich (2009) found how important was the knowledge of Web 2.0 application on the interest of using the applications despite their gender.

Conclusion

Based on the results of the current study, the study was concluded that, using of quick response codes as a learning tool can improve students' engagement, satisfaction, and perceived learning.

Recommendations

- Future studies could investigate the relationship between perceived enjoyment and social influence of QR codes.
- There could be an inquiry into the existence of any relationship between facilitating learning environment by using QR codes and hedonic motivation.
- A comparative study on nurses and physicians' acceptance of using QR codes in health care could be needed.
- Future studies that draw sample from students enrolled on various courses that are employing QR codes for large class activities.
- Apply in-service training program for Instructors to be familiar with this new technology and be ready to learn how to effectively integrate this application in teaching.

References

- Abd El Rahman R., Fayed S. (2019). Effect of Web 2.0 Tools Application on Nursing Administration Students' Self-Directed Learning. International Journal of Novel Research in Healthcare and Nursing 6, (3), 1309-1325, Retrieved from: www.noveltyjournals.com
- Abdel-Salam, A. (2018). The Effect of Using Mobile Device With Quick Response Code on Academic Performance Amongst Pediatric Nursing Students. MNJ, Vol. 3, No. 1, May 2018, PP: 59-76
- Abdol Latif, L., Fadzil, M., Munira, T., & San, N. (2012). Can the use of QR codes enhance m-Learning in a blended learning environment? Journal Lifelong Learning Society, 8(2), 1-20.
- Albastroiu, I., & Felea, M. (2015). Exploring the potential of QR codes in higher education considering the attitudes and interests among Romanian students. International Scientific Conference eLearning and software for Education. Bucharest, April 23-24.
- Axelson R. Flick A. (2010). Defining Student Engagement. Change The Magazine of

Higher Learning 43(1):38-43. DOI: 10.1080/00091383.2011.533096

- Blasco-Arcas, L., Buil, I., HernUndez-Ortega, B., and Sese, F. J. (2013). "Using Clickers in Class. The Role of Interactivity, Active Collaborative Learning and Engagement in Learning Performance," Computers & Education, 62, 102–110, DOI: 10.1016/j.compedu.2012.10.019
- Brooks, D. C. (2016). "ECAR Study of Undergraduate Students and Information Technology, "Research Report, ECAR, Louisville, CO.
- Carini, R.M., Kuh, G. D., and Klein, S. P. (2006), "Student Engagement and Student Learning: Testing the Linkages," Research in Higher Education, 47, 1–32, DOI: 10.1007/s11162-005-8150-9.
- Chen, N., Teng, D., & Lee, C. (2010). Augmenting Paper-Based reading activities with smartphone technology to enhance reading comprehension. Proceedings of the 6th IEEE International Conference on Wireless, Smartphone, and Ubiquitous Technologies in Education (pp. 201-203). doi: 10.1109/WMUTE.2010.39
- Cho, M., & Shen, D. (2013). Self-regulation in online learning. Distance Education, 34(3), 290–301. doi:10.1080/01587919.2013.835770
- Classes," Teaching of Psychology, 34, 194–196.
- Computers in Human Behavior, 28(4), 1417-1426, doi: 10.1016/j.chb.2012.03.004
- Cox, B., & Cox, B. (2008). Developing interpersonal and group dynamics through asynchronous threaded discussions: The use of discussion board in collaborative learning. Education, 128(4), 553–565. Retrieved from https://www.projectinnovation.com/educat ion.html
- Crompton, H., LaFrance, J. & van't Hoof, M. (2012). QR codes 101. Learning & Leading with Technology, 22-23.
- D'Inverno, R. A., Davis, H. C., and White, S. (2003), "Using a Personal Response System for Promoting Student Interaction," Teaching Mathematics and Its Application, 22, 163–169, DOI: 10.1093/teamat/22.4.163.

- Dahlstrom, E., and Bichsel, J. (2014). "ECAR Study of Undergraduate Students and Information Technology, Research Report, ECAR, Lousivile, CO.
- De Pietro, O. and Fronter, G. (2012): Mobile tutoring for situated learning and collaborative learning in AIML application using QR-code. 6th International Conference on Complex, Intelligent, and Software Systems (CISIS-2012). Palermo, Italy, pp. 799-805. accessed: 15/1/2017, 5p.m

DOI:10.1186/s12909-019-1876-4

Ghasemi, M. Moonaghi, H. and Heydari, A. (2020). Strategies for sustaining and enhancing nursing students' engagement in academic and clinical settings: a narrative review. Korean J Med Educ; 32(2): 103-117.

https://doi.org/10.3946/kjme.2020.159

- Gradel, K., & Edson, J. E. (2012). QR codes in higher education: Fad or functional tool? Journal Educational Technology Systems, 41(1), 45-67.
- Gray, J., & DiLoreto, M. (2016). The Effects of Student Engagement, Student Satisfaction, and Perceived Learning in Online Learning Environments (2016). International Journal of Educational Leadership Preparation, 11(1).
- Guo. P., Watts, K. and Wharrad, H. (2015): An integrative review of the impact of mobile technologies used by health care professionals to support education and practice. Nursing Open. Available athttps://www.doi. 10. 1002/nop2.37.
- Harerimana, A., N. G. Mtshali, H. (2019). "Nursing Students' Perceptions and Expectations Regarding the Use of Technology in Nursing Education. Africa Journal of Nursing and Midwifery https://doi.org/10.25159/2520-5293/5103 https://upjournals.co.za/index.php/AJNM/i ndex
- Jabbour, K. (2014): An analysis of the effect of mobile learning on Lebanese higher education. Vol 13 (1). Informatics in Education Vilnius University.
- Judge, D. S., & Murray, B. (2017). Student and faculty transition to a new online learning

management system. Teaching and Learning in Nursing, 12(4), 277–280. doi:10.1016/j.teln.2017.06.010

- Jupiter (2011). QR Code: Present and future. Jupiter Research Publication: Philadelphia, PA.
- Karia, C. Hughes, A. and Carr, S. (2019) Uses of quick response codes in healthcare education: a scoping review. BMC Medical Education 19(1)
- Kuh, G. D., Cruce, T. M., Shoup, R., Kinzie, J., and Gonyea, R. M. (2008), "Unmasking the Effects of Student Engagement on First-Year College Grades and Persistence," The Journal of Higher Education, 79, 540–563.
- Lee, J., Lee, I., & Kwon, Y. (2011). Scan & learn! Use of quick response codes & smartphones in a biology field study. American Biology Teacher, 73(8), 485-492. doi:10.1525/abt.2011.73.8.11.
- Lee, M., & Park, B. (2018). Effects of Flipped Learning Using Online Materials in a Surgical Nursing Practicum: A Pilot Stratified Group-Randomized Trial. Healthcare Inform. Res., 24(1): 69-78.
- Lin K-Y, Teng DC-E. Using quick response codes to increase Students' participation in case-based Learning courses. CIN Comput Informatics Nurs. 2018;36:560–6. https://doi.org/10.1097/CIN.0000000000 00462.
- Mello, L. V. (2016). Fostering postgraduate student engagement: Online resources supporting self-directed learning in a diverse cohort. Research in Learning Technology, 24, 1–16. doi:10.3402/rlt.v24.29366
- Milman, N. B., Posey, L., Pintz, C., Wright, K., & Zhou, P. (2015). Online master's students' perceptions of institutional supports and resources: Initial survey results. Online Learning, 19(4), 45–66. doi:10.24059/olj.v19i4.549
- Mogali SR, Vallabhajosyula R, Ng CH, Shun DLM, Ang ET, Abrahams P. Scan and Learn: Quick Response Code Enabled Museum for Mobile Learning of Anatomy and Pathology. Anat Sci Educ. 2018; ase:1848. https://doi.org/10.1002/ase.1848.

- Muir S., Loredana Tirlea, Brad Elphinstone & Minh Huynh (2020)
- Nur, H. (2020). Teachers and Students' Perception using Quik Response Code Program in EFL Teaching and Learning. Published Master Thesis in Education. State Islamic Institute (IAIN)
- Park, O., & Park, H. (2017). Quasi-experimental study on the effectiveness of a flipped classroom for teaching adult health nursing. Jpn. J. Nurs. Sci. https://doi.org/0.1111/jjns.12176.
- Pérez-Sanagustín, M., Parra, D., Verdugo, R., García-Galleguillos, G., & Nussbaum, M. (2016). Using QR codes to increase user engagement in museum-like spaces. Computers in Human Behavior, 60, 73-85.
- Pillai, A. E., Prakash, D., Al-Marhoobi, N. A., & Shrivastava, M. (2017). Application of QR codes in tourism industry: A review of literature. International Journal of Computer Technology & Applications, 8(6), 678–687.
- Poirier, C. R., and Feldman, R. S. (2007). "Promoting Active Learning Using Individual Response Technology in Large Introductory Psychology
- Promoting Classroom Engagement Through the Use of an Online Student Response System: A Mixed Methods Analysis, Journal of Statistics Education, 28:1, 25-31, DOI: 10.1080/10691898.2020.1730733 https://doi.org/10.1080/10691898.2020.17 30733
- Rabu, S. & Hussin, H. & Bervell, B. QR code utilization in a large classroom: Higher education students' initial perceptions. Education and Information Technologies 2018.
- Rouillard, J. (2008). "Contextual QR codes," Proc. -3rd Int. Multi-Conf. Comput. Glob. Inf. Technol. ICCGI 2008 Conjunction with ComP2P 2008 1st Int. Work. Comput. P2P Networks Theory Practice., pp. 50–55.
- Sampson, T. (2012). QR codes in the classroom. Retrieved from http://www.pbsmartessentials.com/custom ersatisfation/qr-codes-in-the-classroom

- Shin, D., Jung, J., & Chang, B. (2012). The Psychology behind QR Codes: User experience perspective.
- Stocker, B. L. (2018). Transitioning from oncampus to online in a master of science nursing program: A comparative study of academic success. American Journal of Distance Education, 32(2), 113–130. doi:10.1080/08923647.2018.1443371
- Sun, A., & Chen, X. (2016). Online education and its effective practice: A research review. Journal of Information Technology Education, 15, 157–190. doi:10.28945/3502
- Ulrich, W. (2009). Test of a structural model to investigate the impact of instructor knowledge, attitudes, and contextual constraints on intend to use Web 2.0 in online courses. (UMI No. 3380381). Retrieved from: https://eric.ed.gov/?redir=http%3a%2f%2f gateway.proquest.com%2fopenurl%3furl_ ver%3dZ39.882004%26rft_val_fmt%3din fo%3aofi%2ffmt%3akev%3amtx%3adisse rtation%26res_dat%3dxri%3apqdiss%26rf t dat%3dxri%3a pqdiss%3a3380381
- Wefald, A. J., and Downey, R. G. (2009), "Construct Dimensionality of Engagement and Its Relation with Satisfaction," The Journal of Psychology, 143, 91–112. DOI: 10.3200/JRLP.143.1.91-112.
- Yusof, S., Goolamally, N., Latif, L. A. & Fadzil, M. (2012). Using QR Codes in enhancing learning in elementary statistics. In 12th International Conference of Information (ICI12). Kuala Lumpur, 312-321.
- Zakaria, H., Watson, J., & Edwards, S. (2010). Investigating the use of Web 2.0 technology by Malaysian students. Multicultural Education & Technology Journal, 40(1): 17-29.
- Zurmehly J., Adams K., (2017). Using Quick Response Codes in the Classroom Quality Outcomes. Computers, Informatics, Nursing. 35 (10).