

Intention to Utilize Mobile Game-Based Learning in Nursing Education From Teachers' Perspective: A Theory of Planned Behavior Approach

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Abstract—With the significant adverse impact of a pandemic like coronavirus disease 2019 (COVID-19) towards the teaching and learning experience, numerous educational institutions are looking for ways to improve their current practices and meet the challenges of this global threat. Despite the recommendations of applying Information and Communications Technologies (ICT) like video games to alleviate the negative effects of the pandemic, it is still not clear whether nursing teachers are willing to use it. Consequently, this study explored nursing teachers' behavioral intention to employ mobile game-based learning (MGBL), and its relationship amongst core factors of the Theory of Planned Behavior (i.e., perceived behavioral control, subjective norms, and, attitude). Descriptive statistics revealed that most of the nursing teachers were female, a master's degree holder, with an academic rank of instructor, not a licensed professional teacher, and a permanent and full-time employee at private institutions in the Visayas region of the Philippines. Moreover, they do not play mobile games and do not have an experience when it comes to MGBL. Lastly, Spearman's correlation analysis revealed that Theory of Planned Behavior factors correlated positively with the intention of nursing teachers to use MGBL. This descriptive-exploratory study serves as a preliminary exploration of MGBL in nursing education and a future study will cover the prediction of nursing teachers' intention to use MGBL in the classroom.

Keywords—Theory of Planned Behavior, Nursing Education, Game-Based Learning, Mobile Learning Games

I. INTRODUCTION

The unexpected arrival of COVID-19 pandemic has forced a massive shift in nursing education [1]. In order to continue the teaching and learning while complying with prevention and control guidelines and recommendations issued by World Health Organization (WHO) and government agencies, many educational institutions relocated from traditional face-to-face to virtual teaching and learning environments [2]. Fortunately, the positive acceptance and attitude towards online education in undergraduate nursing courses have been well documented in the literature [3-5]. Furthermore, there are corroborations illustrating readiness among lecturers for online classes during pandemic [6, 7] although such 'readiness' is multifaceted and requires employing a contextual perspective [8]. For nursing students, however, recent studies show that conducting fully online courses during the pandemic is entirely a different story as it increases the responsibility for studies [9], reduces social interaction resulting in a negative effect on mental health [10], and is very stressful [11]. On top of the policies that must be put in place by health policymakers and nursing regulatory bodies [2], it is likewise recommended for nursing teachers to support students who are experiencing a declining interest, a lack of motivation, and difficulties on online learning [1].

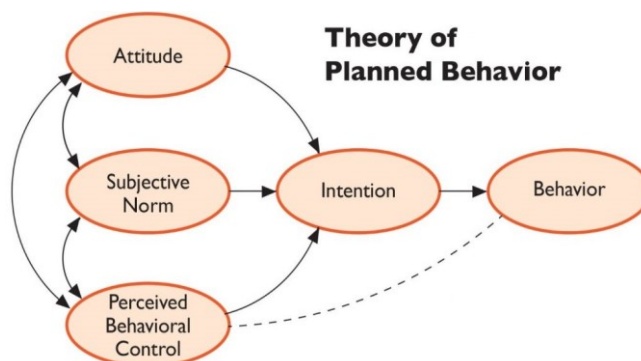


Fig 1. Theory of Planned Behavior

In minimizing the teaching and learning challenges during and precipitated by the COVID-19 pandemic, the integration of ICT within the curriculum has been recommended [12, 13]. Specifically, the technological modality in the form of digital game-based learning has been emerging again in the literature as a complementary tool during emergency online education [14-16]. Even before the pandemic, capturing the attention of nursing students was a challenge [17] as they preferred the use of active teaching strategies such as gaming [18]. On the other hand, nurse educators have been relaxed when it comes to the adoption of new teaching methods, and still use the traditional lecture as the principal teaching mode [19]. With a systematic literature review concluding that the application of gaming in undergraduate nursing education resulted in positive student comments, higher test scores, and increased knowledge [20], there is an opportunity for nursing teachers to implement it during emergency online education. Nevertheless, it is unclear whether nursing teachers are willing to use gaming during this global health crisis. Consequently, this study explored nursing teachers' behavioral intention to incorporate MGBL, and its relationship amongst the core factors of the Theory of Planned Behavior such as perceived behavioral control, and attitude, subjective norms. In addition, the profile of nursing teachers in terms of location, sex, age, academic rank, work schedule, employment status, type of institution, license in professional education, daily gameplay duration, and MGBL experience were also described as a supplementary information. With this exploration, the findings could help educational institutions to formulate strategies on how to encourage nursing teachers on using MGBL in the classroom either face-to-face or online. As to why MGBL was selected rather than computer game-based learning, mobile is at the forefront of gaming [21] and that the former offers more learning opportunities than the latter [22]. This study serves as a preliminary exploration of MGBL in nursing education, and a future study will cover the prediction of nursing teachers' intention to use MGBL in the classroom.



Fig 2. Examples of Casual and Educational Mobile Games for Nursing Education: Hospital Dash, a simulator clicker game for mastering time management as a busy nurse; Rookie Nurse, a fun nursery game where players are responsible for taking care of all the newborns; Nursing Sim, an educational mobile game to practice the multifactor decision-making process of nurse assignment; Operate Now: Hospital, a simulation game to perform realistic surgeries on patients.

II. BACKGROUND OF THE STUDY

A. The Theory of Planned Behavior.

In order to determine the utilization intention of MGBL by nursing teachers, psychological theories such as the Theory of Planned Behavior could be embraced by knowledge explorers who seek to understand the association of beliefs to behavior. This Theory of Planned Behavior suggests that the likelihood of committing to a behavior is correlated with the strength of intention to actually do it [23]. In addition, the commitment to act is the outcome of several factors such as subjective norms, attitude, and perceived behavioral control (see Figure 1). This theory developed by social psychologists has been employed in numerous disciplines including nursing education to aid our understanding of a variety of behaviors (e.g., nursing students' intention to seek clinical experiences [24], report medication errors [25], follow recommendations [26], and attend lectures [27]). In fact, it is the most often used socio-cognitive theory for behavior prediction of healthcare professionals, and that studies that used this theory had significantly better predictive power in comparison with other theories [28]. Therefore, with the goal of identifying the nursing teachers' intention to utilize MGBL in the classroom, the Theory of Planned Behavior was the selected psychological model for this study.

B. Technology-Based Nursing Education

The significance of technology integration in schools and the effective use of educational technologies by teachers have been reviewed numerous times in the literature. In a synthesis of systematic review research, the learning environments and technologies are divided into seven areas such as (1) adaptive learning, (2) learning analytics, (3) mobile learning, (4) social media, (5) massive open online courses, (6) special education technology, and (7) game-based learning [29]. In the context of nursing education, technology has provided nurse educators with the opportunity to incorporate new teaching and learning modalities into the lessons, which supports the demands from the 'digital native generation'. For instance, nursing teachers

implement technology by including high-fidelity simulation to case scenarios [30], adding podcasts as a supplementary tool of delivering teaching materials [31], and many more [29]. On the other hand, nursing students perceive technology as useful and easy to use although they also acknowledge the possibility of it being a distraction [32]. For practicing nurses, they have positive perceptions about the use of technology as it increases care practices, facilitates recording information, and prevents unnecessary labor and loss of work hours [33]. Consequently, the incorporation of technology-based teaching and learning methodology is a welcomed approach in nursing education.

C. Mobile Game-Based Learning

The majority of research on MGBL (32 out of 36, 88.89%, from 2004 to 2016 [34]) is concentrated on its influence on the affective domains rather than cognitive domains. Albeit there is a call for more research to assess student learning by using a test [35], the positive influence of MGBL on attitude, values, enjoyment, and motivation [18] is still valuable especially for a time like this where students are getting more stressful [11] and having a negative impact on mental health [10] due to the COVID-19 pandemic. Mobile- and computer-based games are not new in the field of healthcare. In fact, these games can take many forms, including a pediatric dietary game that employs mechanisms of implicit learning like *fooya!* [36] and a speech therapy gaming rehabilitation like *Theraphasia* [37], to name a few. Nevertheless, developments and proposals of MGBL is not as popular in nursing education. Aside from commercial games that can be downloaded from app stores (see Figure 2), the literature of nursing-themed mobile games from academic journals, conference papers, and dissertations is limited. This calls for future works in this area in order to produce validated and evidence-based mobile learning games that could be used in MGBL. Still, with a systematic literature review concluding that incorporating gaming in undergraduate nursing education resulted in positive student comments, higher test scores, and increased knowledge [20], there is no denying that MGBL has a significant role as an educational methodology.

III. METHODOLOGY

A. Study Design

A cross-sectional, correlational research was conducted to investigate nursing teachers' intention to utilize MGBL, and its relationship on factors such as subjective norms, perceived behavioral control, and attitude. Cross-sectional studies are an example of an observational study design where a researcher measures the exposure and outcomes at the same time. When the phenomena to be studied are quantitative (just like in this study), correlational research design could be merged with the cross-sectional research [38]. Meanwhile, this study involved the use of an investigator-designed questionnaire to collect the necessary information from the target respondents. Contents of this questionnaire was adopted from the core factors of the Theory of Planned Behavior. Finally, this paper serves as the preliminary exploration of MGBL in nursing education and a future study will attempt to discover its predictive factors.

B. Sample and Sampling Technique

The population for this study consisted of nursing teachers who are currently working as a faculty member in any higher education institution in the Philippines during the time of data collection. For the selection and recruitment of participants, a combination of purposive and snowball sampling was used in the study. First, purposive sampling technique was utilized to ensure that the initial set of respondents were selected because they are the people who can provided the needed information, i.e., nursing teachers. In addition, snowball sampling was used as an auxiliary means to top up the sample size.

C. Research Instrument

The questionnaire used in the study consisted of two parts. The first part collected information such as sex, age, academic rank, work schedule, employment status, type of institution, license in professional education, location, daily gameplay duration, and MGBL experience. Afterwards, the second part collected information on the respondents' perceptions on and intention to use MGBL, as indicated by their evaluations on attitude, perceived behavioral control, subjective norms, and behavioral intention. The research instrument was pretested to a set of respondents and Cronbach's analysis were utilized to measure the reliability of the second part of the questionnaire. The five-item attitude ($\alpha = 0.911$), five-item subjective norms ($\alpha = 0.967$), seven-item behavioral control ($\alpha = 0.959$), and 3-item behavioral intention ($\alpha = 0.977$) were all reliable.

D. Data Collection and Analysis

Due to the restrictions caused by the pandemic situations, data for this study were collected through an online survey in July 2021. For the survey distribution, the link was posted in the social media accounts of the authors, and was sent to the deans and faculty members of different colleges of nursing. Respondents were also encouraged to forward the link to their co-faculty members and colleagues. Details of the study were presented on the first page of the survey. Nursing teachers were asked to proceed with the survey only upon consenting to participate in the study. Privacy and confidentiality of all data collected was maintained throughout the study. Data was treated using various statistical tools such as frequency counts, percentages, Cronbach's alpha analysis, one-way chi-square, and Spearman rank-order correlation coefficient.

IV. RESULTS AND DISCUSSION

The goal of this study was to investigate nursing teachers' intention to use MGBL and its relationship amongst the core factors of the Theory of Planned Behavior such as perceived behavioral control, and attitude, subjective norms. Further, it also sought out the profile of nursing teachers in terms of sex, age, academic rank, work schedule, employment status, type of institution, license in professional education, location, daily gameplay duration, and MGBL experience.

TABLE I. DEMOGRAPHIC PROFILE DISTRIBUTION

Characteristics	N	%
Location		
Luzon	19	25.00
Visayas	55	72.37
Mindanao	2	2.63
Gender		
Male	25	32.90
Female	51	67.10
Academic Rank		
Lecturer/Instructor	37	48.68
Assistant Professor	22	28.95
Associate Professor	11	14.47
Professor	6	7.89
Work Schedule		
Full-Time	62	81.58
Part-Time	14	18.42
Employment Status		
Permanent	47	61.84
Non-Permanent	29	38.16
Type of Institution		
Public	22	28.95
Private	54	71.05
Highest Educational Attainment		
Bachelor	17	22.37
Masters	44	57.89
Doctorate	15	19.74
Licensed Professional Teacher		
Yes	32	42.11
No	44	57.89
Daily Gameplay Duration		
I do not play mobile games	40	52.63
Less than 1 hour	14	18.42
Between 1-2 hours	12	15.79
Between 3-4 hours	7	9.21
Between 4-5 hours	2	2.63
More than 5 hours	1	1.32
Experience with Mobile Game-Based Learning		
Yes	20	26.32
No	56	73.68
	M	SD
Age	41.28	9.91
Experience	11.14	7.64

A. Profile of the Respondents

Table 1 shows the profile of the respondents. A total of 76 nursing teachers participated to the online survey. The average age and years of teaching experience of the respondents were 41.28 and 11.14 years, respectively. The majority were female ($n = 51, 67.1\%$), a master's degree holder ($n = 44, 57.9\%$), with an academic rank of instructor ($n = 37, 48.7\%$), not a licensed professional teacher ($n = 44, 57.9\%$), and a permanent ($n = 47, 61.8\%$) and full-time ($n = 62, 81.6\%$) faculty at private higher education institutions ($n = 54, 71.1\%$) in the Visayas ($n = 55, 72.4\%$) region of the Philippines. Most of the nursing teachers do not play mobile games in a daily basis ($n = 40, 52.6\%$) and do not have an experience with MGBL ($n = 56, 73.7\%$).

The result of one-way chi-square showed that the number of respondents in terms of sex was not equally divided as it is dominated by female ($\chi^2 = 8.895, DF=2, p=0.003$). This is not surprising most especially that nursing and education are both female-dominated occupations [39]. The highest educational attainment of respondents was not also equally divided as most nursing teachers are a master's degree holder ($\chi^2 = 20.711, DF=2, p=0.000$). This is common in higher education institutions as master's degree is the minimum requirement for teaching at a university level. In relation to licensure, the respondents were equally divided albeit most teachers are not a licensed professional teacher ($\chi^2 = 1.895, DF=2, p=.169$). Professional teaching license is not mandatory when teaching at a university level, rather, license as a nurse is when teaching undergraduate nursing courses. Finally, respondents were not equally divided in terms of their MGBL experience, whereas most teachers have not experienced using MGBL for teaching purposes ($\chi^2 = 17.053, DF=2, p=.000$). This could be explained by the fact that most nursing teachers do not have a background in education, and used to the traditional approach of lecture discussion [19] as seen from former professors.

TABLE II. CORRELATION BETWEEN VARIABLES

Independent Variables	<i>r</i>	<i>p-value</i>
Subjective norms	.617	.000
Attitude	.431	.000
Behavioral control	.334	.003

*significant if $< .05$

B. Correlates of Behavioral Intention to Use MGBL

Despite that the majority of teachers in nursing do not play mobile games and have not experienced utilizing MGBL for instructional purposes, they appear to have moderate to high intention to use MGBL as indicated by their above midpoint score. This seems to indicate a good opportunity to introduce MGBL to nursing teachers as intention is a good determinant of behavior [23, 40]. Moreover, bivariate analysis as shown in Table 2 revealed that there was a significant positive moderate correlation ($r = .617, p = .000$) between subjective norms and intention to use MGBL. There was also a significant positive moderate correlation ($r = .431, p = .000$) between attitude and intention to use MGBL. Perceived behavioral control had a significant yet positive weak correlation ($r = .334, p = .003$) between attitude and intention to use MGBL. Our findings indicate that nursing teachers are likely to utilize MGBL when people they consider important to them supports the use of MGBL, if they are positive about the use of MGBL, and if they see themselves able or in control in the use of MGBL. While there has been limited research on teachers' intention

to use MGBL in nursing education, evidence on the ability of the Theory of Planned Behavior to explain intention to use mobile learning and play mobile games among students are relatively consistent. Prior research among university students in the United States found that attitude, subjective norm and behavioral control predicted intention to play augmented reality mobile games [41]. Another study in the United States showed that college students' acceptance of mobile learning can be explained by the Theory of Planned Behavior reasonably well [42]. Likewise, the three variables of the Theory of Planned Behavior also influenced intention to adopt mobile learning among University students in Ghana [43].

V. CONCLUSION

This study attempted to determine intention to use MGBL by nursing teachers and paint a portrait of their profile as part of the initial exploration of MGBL in nursing education. With the findings presented, nursing teachers were female, with an academic rank of instructor, a master's degree holder, not a licensed professional teacher, and a permanent and full-time employee at private higher education institutions. In addition, they do not play mobile games and have not experienced the use of MGBL for instructional purposes, yet they still appear to have moderate to high intention to utilize it. Meanwhile, the constructs of the Theory of Planned Behavior such as attitude, subjective norms, and perceived behavioral control can be useful in explaining the intention of nursing teachers towards usage of MGBL as a teaching and learning tool. These factors may be tapped to increase the likelihood of MGBL adoption. Creating a supportive environment, changing the pessimistic attitude, and improving competence on the use of MGBL may be necessary to encourage the utilization of MGBL in nursing education among nursing teachers. Introducing MGBL to nursing teachers and possibly providing them training on its value and use may also be considered by educational leaders.

Finally, the study has certain limits that must be reported such as self-reporting of data, convenience sample of teachers, a small sample size, and a cross-sectional nature design, which decreases the generalizability of findings to other settings. The focus of the study was to conduct a preliminary analysis of the status of MGBL in nursing education, and we suggest caution on the use of the preliminary findings. Future works on factors predicting nursing teachers' intention to utilize MGBL and the development of a mobile game will be covered in continuation of this paper. Nevertheless, the findings presented in this study enrich the literature on MGBL in nursing education.

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