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Investigating the Determinants of Preservice Teachers' Intentions to Accept Commercial Video Games for Teaching-Learning

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Particularly, in sub-Saharan Africa, where game-based learning is still in its nascent stages, it is important to understand the factors that shape preservice teachers' intentions to adopt commercial video games in their teaching-learning practice. A proposed model was tested against online survey data collected from 298 preservice teachers from four colleges of education in the northern region of Ghana, using structural equation modeling (SEM). The results showed that while Preference had a positive but insignificant effect on Intention, Experience and Learning Opportunity demonstrated strong, positive, and significant effects, consistent with existing findings in the acceptance of game-based learning. Subjective Norm, aligned with the Theory of Reasoned Action and Planned Behaviour also showed a strong, positive, and significant effect on Intention, whereas Gender had no significant effect on Experience conflicting findings from the study of parents' acceptance of video games. The final model with Experience, Learning Opportunity, and Subjective Norms explained 44.5% of the variance in intention to use COTS games. The study implies that to foster successful adoption: (1) there is the need for hands-on workshops and practical sessions, allowing for experimenting with COTS games, (2) the educational benefits of COTS games should be emphasized among preservice teachers, and (3) there should be environments that support peer-mentoring and collaborative learning about COTS games.

Keywords: game-based learning, technology acceptance, preservice teachers, commercial video games, teacher training, Ghana

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INTRODUCTION

Game-based learning represents a significant evolution in education, seamlessly combining the engaging elements of entertainment with instructional goals (Assapun & Thummaphan, 2023). Twenty-first-century learners, often regarded as 'digital natives' (Thompson, 2013; Prensky, 2001), demonstrate a strong preference for game environments (Roettl & Terlutter, 2018), driving the growing popularity of game-based learning. Of the estimated 3.32 billion global video game players, approximately 58% are students who engage with games not only for entertainment but also as educational tools (Leonhardt & Overa, 2021; Kaimara et al., 2023). Therefore, the dual utilization of digital video games for both educational and entertainment purposes is evident (Hussein et al., 2019).

There are three principal approaches for integrating video games (Van Eck, 2006). The first approach involves engaging students in the process of designing and developing games from the ground up. The second approach sees educators or game developers crafting games explicitly intended for pedagogical purposes. The third, and the focus of this study, is the integration of commercial off-the-shelf (COTS) video games (Aleksic et al., 2016). COTS games are video games developed and distributed for general consumer use, typically for entertainment purposes, without customization for specific educational needs (Nieborg & Poell, 2018). COTS are often viewed as limited in educational value; however, a scoping review revealed that 26% of game-based learning studies in secondary schools focused on COTS games (Cole et al., 2023).

Sub-Saharan Africa's young population and increasing digital access make it a rapidly growing market for COTS games. The number of gamers in the region grew from 77 million to 186 million between 2015 and 2021 (Gaming Industry Africa, 2021). Nevertheless, the gamers are not playing for the purpose of education. It is evident that the use of COTS games in education has rarely, if ever, been observed or discussed in this region (Blatnick-Gagne & Caverly, 2015). Drawing on the first author’s extensive experience spanning over two decades as a mathematics tutor in teacher training, there has been no observed instance of COTS games being utilized in classroom settings. This gap raises important questions for researchers to explore, such as: What factors contribute to the slow integration of COTS games into educational contexts in the sub-Saharan Africa region, despite their widespread availability and appeal?

The intention to adopt COTS is a key element in the broader acceptance of game-based learning (Bourgonjon et al., 2013; Shiue & Hsu, 2017; Ruth et al., 2022; Wang et al., 2017). This variable is critical because it directly influences the actual adoption and integration processes (Davis, 1989). Multiple variables may shape the intention to accept COTS games. These variables are related to three key important players in the education context: teachers (Kirriemuir & McFarlane, 2004; Schifter & Ketelhut, 2000; Schrader et al., 2006; Bourgonjon et al., 2013), students (Bourgonjon et al., 2010), and parents (Bourgonjon et al., 2011). There is a fourth player for which upon reviewing the existing literature, it is apparent that few studies have focused on exactly, “preservice teachers” (Belda-Medina & Calvo-Ferrer, 2022; Fung et al., 2022; Li, 2013). Most of these studies have been conducted outside the sub-Saharan region, highlighting a need

for localized research in this context. It is here that much attention should be placed since game-based learning is still in its nascent stages. We maintain that preservice teachers are equally valuable to the education system. As the future educators whom upon completion fill the gaps left by retirees, resigns, or deceased, they keep the teacher supply chain. If COTS games are to be integrated into the classroom, it is essential to understand their perceptions (Richardson, 2013), just as has been done to their counterparts in more developed regions. This is because the successful game-based learning hinges on the educational value they may place on them. The purpose of this study is to investigate the factors influencing the acceptance of COTS games among preservice teachers in Ghanaian teacher training colleges.

Literature Review and Hypotheses Development

Game-based learning offers numerous pedagogical advantages, such as enhanced student engagement, personalized learning, and the development of critical thinking skills (Kaimara et al., 2023). The actual integration of video games is determined by the intentions to use them, which are influenced by factors such as preference, subjective norms, learning opportunities, gender, and experience (see Bourgonjon et al., 2011). Studying these factors in sub-Saharan Africa, where game-based learning is still emerging, is equally important. The following section summarizes literature to support the relationships between the proposed factors and preservice teachers' intentions to use COTS games (see Fig. 1).

Preference

Preference is a significant factor in the acceptance of game-based learning. Hsu and Lu (2007) were among the first to introduce preference in their study of the adoption of online games, defining it as the extent to which peoples who enjoy gaming experience positive emotions within a particular gaming context. This variable has since been extended across various studies to explain the behavioural tendencies of peoples in different gaming environments. Skoien and Berthelsen (1996) conceptualized preference as peoples' predisposition to act in alignment with their beliefs (psychological and emotional aspects) about gameplay. Bourgonjon et al. (2010) included preference in their model as a behavioural measure to assess the level of approval students have for educational games, showing that a positive preference directly correlates with higher acceptance and adoption rates. This finding was reinforced in their later study (Bourgonjon et al., 2011), where preference was shown to play a key role in parental acceptance of game-based learning. Teachers' acceptance of game-based learning has also been significantly influenced by preference, with a study showing that a positive disposition towards games enhance teachers' intention to integrate these tools into their teaching (Bourgonjon et al., 2013). Hwang and Wu (2012) demonstrated that learners' preferences significantly influenced their game-based learning outcomes and engagement. Li and Tsai (2013) found that students' preferences were linked to both enjoyment and perceived educational value of game-based learning. Despite, preference has not been extensively studied as a predictor of preservice teachers' intention to use COTS games in sub-Saharan African context. This study fills this gap. In this context, rather than defining preference as a general liking for video

games, the focus should shift from personal enjoyment of video games to their pedagogical value. It should be redefined as the teacher's attitude towards using video games as an educational tool. This definition reflects the preservice teacher's openness, willingness, and perceived value of COTS games in teaching practices. The current study, therefore, proposes that: H1: *Preference has positive effect on preservice teachers' intention to adopt commercial video games in teaching and learning.*

Experience

Theoretically, prior experience significantly shapes users' intentions to accept new technologies. Especially in the Unified Theory of Acceptance and Use of Technology (UTAUT), experience controls behavioural intention (Venkatesh et al., 2003). As users gain familiarity with technology, their perceptions of usefulness, ease of use, and social implications become more pronounced. Agarwal and Prasad (1999) found that individuals with more computer experience perceived greater ease of use and usefulness strengthening their intention to adopt information technology. Experience positively influences both students' (Teo et al., 2019) and educators' (Hernandez et al., 2011) intentions to continue using ICT tools. Liaw (2008) found that students with prior exposure to e-learning environments showed higher intentions to participate in future e-learning activities. Teo (2011) found that teachers with experience using technology in their teaching expressed stronger intentions to integrate into their classrooms. Experience with video games involves dedicated time to gameplay, diverse game choices, and immersion in gaming culture. Bourgonjon et al. (2011) found that parents' experience with video games influenced their acceptance of game-based learning for their children. Therefore, preservice teachers' acceptance of COTS games hinges significantly on their gameplay experience. We posit that: H2: *Preservice teachers' experience with video games positively influences their intention to adopt commercial video games for teaching and learning*.

Learning Opportunity

Video games are seen primarily as platforms that create opportunities for learning (Egenfeldt-Nielsen, 2007). Bourgonjon et al. (2010) first introduced the concept of learning opportunity (LO) to examine how students perceive the educational benefits of using video games in learning. It is analogized to the concept of perceived usefulness in the technology acceptance model (TAM). That is to say, LO as used in this study serves as an equivalent construct to perceived usefulness in the original TAM. As defined by Davis (1989), perceived usefulness focuses on the tangible outcomes of using general technology. In analogy, LO translates to the potential of video games to enhance overall teaching and learning outcomes. Bourgonjon et al. (2013) found that video games offer rich LO that enhance student motivation and prompt teachers to integrate them into teaching practices. Parents also support educational games when they see benefits for their children (Bourgonjon et al., 2011). Students likewise are eager to learn with games that helps them achieve their learning objectives (Bourgonjon et al., 2010). Papastergiou (2009) and Hainey et al. (2016) further demonstrated that games that are perceived to improve learning outcomes and retention rates across various subjects and age groups has profound effect on usage intents. The present study operationalizes LO specifically

to refer to preservice teachers' beliefs about the extent to which using COTS games in classrooms provide students with valuable learning experiences and conceptual understanding. It logically follows that their perceptions of COTS games' LO will strongly predict their intention to use these games. Therefore, we hypothesized that: H3: *Learning opportunities in commercial video games directly positively affect preservice teachers' intentions to adopt them in teaching and learning.*

Subjective Norm

Triandis et al. (1971) suggested that people's behaviours are swayed by normative messages. The theory of reasoned action (Fishbein & Ajzen, 1975) and the later theory of planned behaviour (Ajzen, 1991) propounded that human behaviour is always affected by subjective norm (SN). Fishbein and Ajzen (1975) define SN as an individual's perception of the social pressures from significant others regarding whether they should engage in a particular behaviour. This perception directly influences a person's intention to act. SN has an indirect effect through personal belief systems. Venkatesh and Davis (2000) argue that individuals internalize the beliefs of important referents, incorporating them into their own belief structures, which ultimately influence their thoughts and actions. SN has a stronger influence during the initial stages of technology acceptance, especially when individuals are unfamiliar with the new technology (Venkatesh & Davis, 2003). The concept of SN further elaborates that social influence-such as recommendations from friends or the popularity of a game within a social circle. Studies found that social factors and community involvement were strong predictors of intention to play online games (Hsu & Lu, 2004; Wu et al., 2010). SN has had significant effects on the acceptance of game-based learning among students (Bourgonjon et al., 2010), parents (Bourgonjon et al., 2011), and teachers (Bourgonjon et al., 2013). The relationship between SN and preservice COTS games acceptance intentions has theoretical standing. As a results, we hypothesize that: H4: *Subjective norm has positive effect on preservice teachers' intention to adopt commercial video games in teaching and learning.*

Gender

Research have depicted information technology (IT) as a field traditionally dominated by males. Male students tend to have more positive attitudes toward computers and report fewer issues when using IT than their female counterparts (Reinen & Plomp, 1997). Male teachers more likely incorporate computers in their teaching practices (Tondeur et al., 2008). Although gender disparities may be diminishing for common applications such as word processing (Volman et al., 2005), it is still important to explore gender differences in the acceptance of newer, less familiar technologies. Studies on video game behaviour reflect similar trends found in technology integration research. It is commonly reported that males show greater interest in video games, play them more frequently and for longer durations, and choose a wider variety of games (Bonanno & Kommers, 2008). One explanation for the persistent gender gap is that females often dislike the amount of combat and violence in video games (Hartmann & Klimmt, 2006), as well as the stereotypical portrayal of women as incompatible with games (Boyle & Connolly, 2008). Males generally report higher levels of prior gaming

experience compared to females (Smith, 2018). This corroborates to the fact that in gaming culture, males are more experienced than females and therefore males tend to be more intent for the use of educational games than females. Based on these insights, it can be clearly proposed that: H5: *Preservice teachers' gender has positive effects on their intention to adopt commercial video games in teaching and learning.*

Research Model

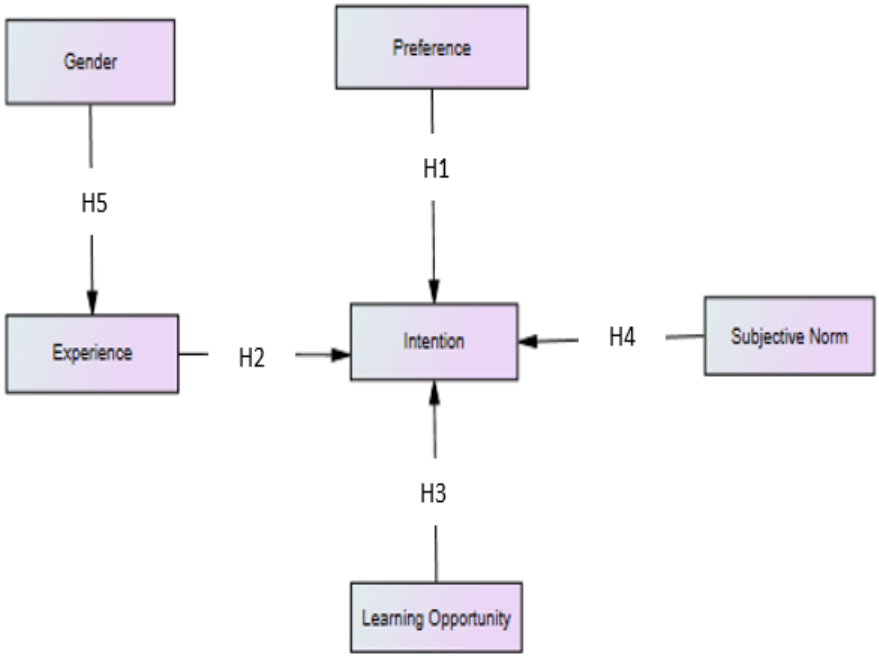

Figure 1
Hypothesized model

METHOD

Research Design and Participants

This study employed a purely quantitative, cross-sectional online survey design within the positivist paradigm, focusing on a sample of 298 preservice teachers enrolled in colleges of education in the Northern Region of Ghana (N = 1166). The sample size was calculated using the inverse square root formula by Kock and Hadaya (2018) and was further supported by the Yamane formula. The survey was developed using Google forms and the link was shared with the various students WhatsApp platforms. Responses were monitored continuously on Google Forms until the number of 298 was reached, at which point further responses were muted. The collected data were downloaded in Excel format (.xlsx) and underwent a thorough cleaning process to identify any missing or erroneous entries. The average age of the respondents ranged from 20 to 25 years, with 70.1% male and 29.9% female.

Instruments

The online survey questionnaire consisted of two sections: one focused on demographic information and the other on the variables included in the research model (see Fig. 1). The demographic section included variables such as age and gender. Previously validated scales were used to measure the variables. Experience (Exp), learning opportunities (LO), and preferences (Pref) were measured using slightly adapted scales from Bourgonjon et al. (2010). Subjective norm (SN) was measured using the adapted scale from Fishbein and Ajzen (1975), while intention was measured with modified items sourced from Venkatesh et al. (2003). By using modified previously validated measures, we aimed to validate and extend existing research into new contexts. All measurement items were rated on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree)**.**

Instrument Validation

Exploratory Factor Analysis

The exploratory factor analysis was done in SPSS (version 23), using principal component analysis (PCA) with varimax rotation. It was computed to reconstruct the proposed four factor structure. All criteria for factor analysis were met. The sample size was deemed adequate, the Kaiser–Mayer-Olkin (KMO) measure of sphericity was greater than the recommended threshold of 0.60 (KMO = 0.760), and the Bartlett's test of sphericity was significant at 5% ($p < 0.001$). The determinant of the correlation matric was 0.001 (> 0.001) implying that the correlation matrix is not nearly singular, which suggests that there is lower multicollinearity or linear dependence among some of the variables. That is, the data is suitable for factor analysis. The four-factor structure accounted for 61.453% of cumulative variance among the items. For all the items on the original scale, 27 failed to get factor loadings higher than the 0.50 threshold on their intended factor, therefore they were iteratively removed (see Table 1).

Table 1
Principal component analysis-varimax rotation (n = 298)

	Component				
Item	1	2	3	4	5
Exp1	.694				
Exp3	.748				
Exp4	.731				
Exp5	.770				
Exp8	.734				
Pref1		.740			
Pref2		.799			
Pref4		.726			
Pref6		.742			
Pref7		.769			
Int1			.759		
Int2			.773		
Int3			.829		
Int4			.792		
SN7				.817	
SN8				.802	
SN9				.821	
SN10				.794	
LO4					.729
LO6					.811
LO7					.793
LO9					.777

Exp = Experience; Pref = Preference; Int = Intention; SN = Subjective Norm; LO = Learning Opportunity

Confirmatory Factor Analysis

Confirmatory factor analysis was performed with AMOS (version 23) to test the stability of the factor structure. Firstly, the fit indices for the measurement model were computed to determine the consistency of the factor structure. Error terms were not allowed to correlate, better still the model was fit. It was found that all fit indices met the accepted benchmarks according Hu and Bentler's criteria (Hu & Bentler, 1999): CMIN/df = 1.54; RMSEA = 0.043; RMR = 0.048; CFI = 0.953; GFI = 0.921, and TLI = 0.945. In addition, all items loaded higher on their intended latent factors (>0.50). Fig. 2 shows a diagram of the measurement. Internal consistencies of the subscales were examined through reliability analysis of the dataset (n = 298). All the five subscales had satisfactory levels of internal consistency and were therefore deemed reliable enough. All subscales scored higher Cronbach alpha coefficients ($\alpha > 0.70$) (Cronbach, 1951): Intention ($\alpha = 0.834$); Experience ($\alpha = 0.811$); Preference ($\alpha = 0.803$); Subjective Norm ($\alpha = 0.834$); Learning Opportunity ($\alpha = 0.808$). In order to check whether the variables in the scale differ from one another, discriminant validity was assessed. Discriminant validity was checked using Fornell and Larker (1981) criterion used in most studies (e.g. Hamid et al., 2017; Roemer et al., 2021). The square root of all AVEs were greater

than the correlation coefficients of the latent variables and that the minimum square root of the AVEs (0.736) was bigger than the maximum correlation coefficient (0.430). Therefore, it was concluded that discriminant validity was achieved. Similarly, convergent validities of the constructs were assessed using estimates of composite reliability (CR) and Average Variance Extracted (AVE) (Bornmann et al., 2009; Carlson & Herdman, 2012). All the CR values were greater than 0.7 ranging between 0.855 and 0.883. Also, all AVEs were above the minimum benchmark of 0.50 (Mendes dos Santos & Cirillo, 2021).

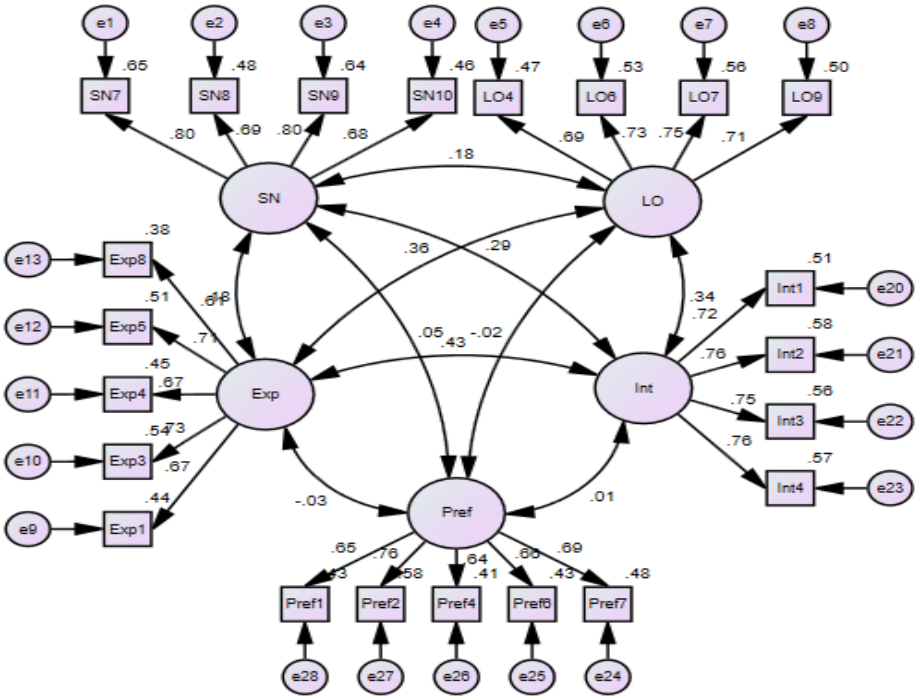

Figure 2
Measurement model

FINDINGS

Descriptive Statistics and Normality Test

Descriptive analysis of the data revealed that: the Experience (Exp) subscale had the highest mean (3.968, Std. Dev. = 0.775), indicating that preservice teachers have experience with video games, particularly on personal computers and smartphones. Within this subscale, item Exp5 scored the highest mean (4.10, Std. Dev. = 0.998). The Preference (Pref) subscale followed closely with a mean of 3.967 (Std. Dev. = 0.824). Items Pref1 and Pref6 both had a high mean of 4.11, suggesting potential collinearity due to similar interpretations. Overall, responses indicated a strong preference for commercial video games among preservice teachers. The Intention (Int) subscale, the

main independent variable, scored a mean of 3.862 (Std. Dev. = 0.867), with Int2 recording the highest individual mean (3.90). This suggests that despite limited emphasis on game-based learning in colleges, preservice teachers in the Northern region of Ghana harbor positive intentions to engage with these tools. The Subjective Norm (SN) subscale had a mean of 3.633 (Std. Dev. = 0.931), indicating that discussions among peers and faculty about the potential of commercial video games positively influence preservice teachers' perceptions. Finally, the Learning Opportunity (LO) subscale showed a mean of 3.867 (Std. Dev. = 0.830), with item LO9 scoring the highest mean (3.94). This suggests that preservice teachers perceive commercial video games as useful for teaching and learning purposes. The skewness values ranged from -1.313 to 1.122, and kurtosis values ranged from -0.337 to 4.818, indicating that univariate normality was achieved. According to Kline (2010), skewness and kurtosis values within ±2 and ±7, respectively, are indicative of normality. However, an analysis using Mahalanobis distance identified several observations (194, 245, 165, 239, 215, 189, 187, 269, 185, 217, 211) as outliers, positioned farthest from the centroid (mean). These outliers potentially disrupt the assumption of normality. While some researchers recommend removing such outliers (reference), we opted to retain them and instead utilized bootstrapping, a robust non-parametric technique. This approach effectively addresses issues arising from non-normal data distributions.

Table 2
Descriptive analysis of the subscales
Exp = Experience; Pref = Preference; Int = Intention; SN = Subjective Norm; LO = Learning Opportunity

Subscale	Mean	Std. Dev.	Skewness	Kurtosis
Experience (Exp)	3.968	0.775		
Exp1: I felt completely absorbed in the game	4.00	1.035	-1.260	4.818
Exp3: I found the game controls intuitive and easy to use	3.87	1.045	-.793	.495
Exp4: I felt a sense of accomplishment when I achieved my goals in the game	3.94	1.070	-1.212	1.069
Exp5: I was able to lose track of time while playing the game	4.10	0.988	-1.385	1.964
Exp8: I felt a sense of immersion in the game's world	3.93	0.993	-.962	.699
Preference (Pref)	3.967	0.824		
Pref1: I enjoy games that require strategic thinking	4.11	1.167	-1.313	.837
Pref2: I prefer games with high-quality graphics and immersive environments	3.78	1.096	-.738	-.186
Pref4: I am attracted to games that involve fast-paced action and quick reflexes	4.01	1.041	-.959	.345
Pref6: I prefer games where I can cooperate with other players to achieve a common goal	4.11	1.088	-1.222	.825
Pref7: I like games that offer a variety challenges and puzzles to solve	3.82	1.111	-.890	.295
Intention (Int)	3.862	0.867		

Int1: I will use COTS games to learn in the future	3.90	1.085	-1.250	1.183
Int2: I will continue to use COTS games to learn in the future	3.95	1.062	-.973	.417
Int3: I will use COTS games to teach in the future	3.86	1.003	-1.072	1.040
Int4: I will continue to use COTS games to teach in the future	3.75	1.094	-.902	.226
Subjective Norm (SN)	3.634	0.932		
SN7: National education bodies advocates learning with COTS games	3.66	1.147	-.702	-.210
SN8: Teacher professional development bodies advocate learning with COTS games	3.56	1.069	-.538	-.142
SN9: The media advertises COTS games as effective learning tools on the media	3.65	1.183	-.689	-.337
SN10: The media advertises COTS games as effective learning tools on the media	3.65	1.160	-.702	-.206
Learning Opportunity (LO)	3.867	0.830		
LO4: Using COTS games in my learning would increase my knowledge retention	3.84	0.977	-.874	.513
LO6: I find COTS games to be very useful for my teaching practice	3.85	1.053	-.984	.544
LO7: I find tutors use COTS games effective for my learning of abstract concepts	3.84	1.095	-.926	.249
LO9: I feel that COTS games are reliable teaching and learning tools	3.94	1.038	1.122	.818

Structural Equation Modelling

Structural equation modelling was computed in AMOS (version 23) to assess the relationships among the constructs as proposed in the research model in Fig. 1. Because there were some issues with the normality of the data (see Table 2), bias corrected bootstrap was used in the maximum likelihood estimation procedure to deal with potential bias in the data that contribute to the non-normality and provide more accurate estimates. The analysis involved 5000 bootstrap samples at 95% confidence level. Fit indices were assessed and it revealed that the structural model is fit. The empirical model is presented in Fig. 3, which includes the path coefficients and the percentage of variance explained in the dependent variables by the significant predictors.

A remarkable finding that contradicts the findings of the study by Bourgonjon et al. (2010, 2011) was that Preference has positive insignificant effect on Intention (Estimate = 0.014, p-value = 0.0825). However, in support of a similar finding, Experience revealed strong positive significant effect on intention (Estimate = 0.380, p-value < 0.01). As expected, based on the technology acceptance model (Davis, 1989) learning opportunity which was analogous to perceived usefulness appeared to have strong positive significant effect on intention (Estimate = 0.237, p-value = 0.002). Similarly, the hypothesis regarding subjective norm as underpinned on the theory of reasoned action and planned behaviour (Ajzen and Fishbein, 1975) was confirmed. It was found that subjective norm has strong positive significant effect on intention (Estimate = 0.167, p-value = 0.003). Most notably conflicting with what has been confirmed in previous studies (e.g., Bourgonjon et al., 2011), Gender showed no significant effect on experience (Estimate = 0.028, p-value = 0.774). Cumulatively, the model was able to

explain 44.5% of the total variance in preservice teachers' intention to adopt COTS games in teaching and learning. Further examination of the path coefficients shows that the share of the variances in all the significant predictors in the prediction of Intention was high and statistically significant. Goodness-of-fit indices were calculated for the full empirical model (chi-square/df = 1.663; RMSEA = 0.046; RMR = 0.078; CFI = 0.938; GFI = 0.911, and TLI = 0.930). Given that the significant predictors contributed significantly to the explained total variance in Intention and based on the fit indices, the model demonstrates an acceptable fit and predictive power (see Fig. 3).

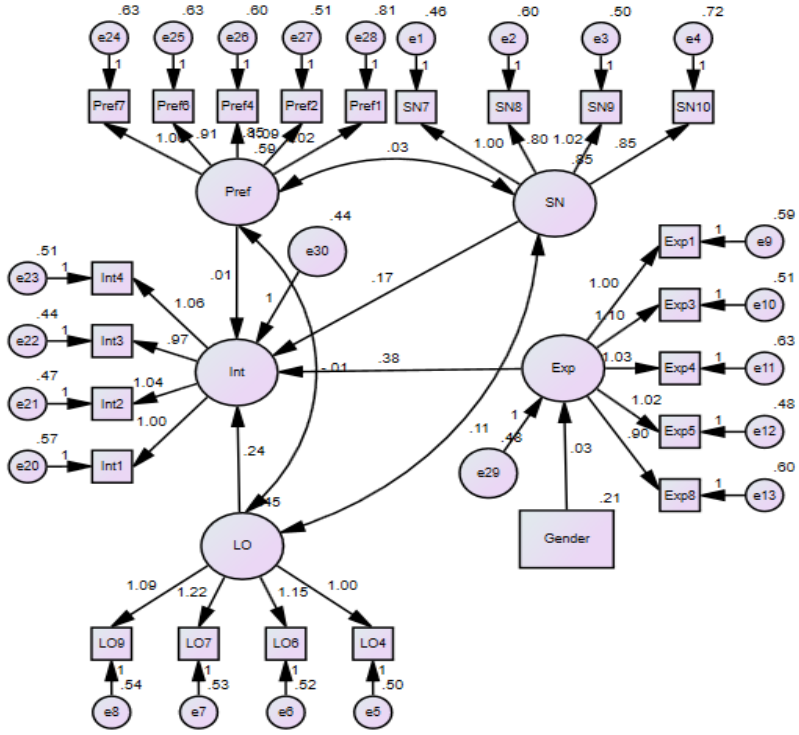

Figure 3
Empirical model

DISCUSSION AND CONCLUSION

The present study investigated the relationships among Preference, Experience, Learning Opportunity, Subjective Norm, and Intention to use COTS games in teaching, focusing on pre-service teachers. The structural model showed good fit and explained a significant portion (44.5%) of the variance in Intention. However, the results provide intriguing insights, some of which deviate from existing literature. One unexpected result was the insignificant effect of Preference on Intention. This contradicts the findings of Bourgonjon et al. (2013), who identified preference as a significant predictor

of teachers' behavioural intention for game-based learning adoption. A possible explanation could lie in the evolving role of personal preference in video adoption, where professional requirements and external expectations may outweigh personal likes or dislikes. Supporting this, Subjective Norm was found to have a significant positive effect on Intention, consistent with the Theory of Reasoned Action (TRA) and Theory of Planned Behaviour (TPB) (Ajzen & Fishbein, 1975). In line, Shin (2010) found that subjective norms played a larger role than personal preferences in the adoption of mobile internet services. This shift indicates that the adoption of technological tools like commercial video games may now be driven more by practical considerations, such as perceived usefulness or external pressures, than by personal preference. The influence of social pressures on technology adoption has been well-documented in various sectors, including education and healthcare (Pan et al., 2018). In this context, if pre-service teachers perceive that their peers or mentors endorse the use of commercial video games, they are more likely to adopt them as well. This highlights the importance of fostering a supportive environment in teacher education programs. Also, Experience showed a strong and significant effect on Intention, which aligns with existing technology adoption research. Experience with a particular technology increases familiarity, comfort, and thus the likelihood of adoption, as supported by research on mobile technology and e-learning systems (Shin, 2010; Pan et al., 2018). This also aligns with the Technology Acceptance Model (TAM), where experience has been identified as a key external factor influencing perceived ease of use and usefulness (Abdullah & Ward, 2016). As experience shapes perceptions, teacher education programs should prioritize providing opportunities for hands-on engagement with commercial video games. Furthermore, the significant effect of Learning Opportunity (analogous to perceived usefulness) on Intention corroborates the core tenet of TAM, where perceived usefulness is one of the most important predictors of behavioural intention (Davis, 1989). This finding is consistent with studies in e-learning contexts, where perceived usefulness significantly predicts intention to use educational technologies (Cigdem & Topcu, 2015). Therefore, pre-service teachers are likely to adopt commercial video games if they perceive them as effective learning tools. This highlights the need for teacher educators to clearly communicate the pedagogical benefits associated with this category of games. Finally, Gender showed no significant effect on Experience. This is consistent with previous studies that found gender to have little to no influence on the adoption of educational game technologies (Bourgonjon et al., 2011). Gender neutrality in the adoption of commercial video games suggests that both male and female pre-service teachers experience similar levels of comfort and familiarity with these technologies, reinforcing the need for universal training approaches that do not rely on gender-based assumptions. In conclusion, this study extends our understanding of the factors influencing pre-service teachers' adoption of commercial video games in teaching. The findings emphasize the importance of Experience, Learning Opportunity, and Subjective Norm as critical predictors of adoption intention. These results offer practical guidance for designing teacher training that encourage the successful integration of commercial video games. Through fostering supportive environments, offering hands-on experiences, and clearly demonstrating the educational benefits of COTS games, colleges can increase the likelihood of adoption among pre-service teachers.

Implications for Research

The purpose of this study was to understand the factors that determine the intention that underlie the initial acceptance of commercial video games as teaching and learning tools. By specifically focusing on preservice teachers in colleges of education, this paper depicts a more detailed picture of teachers' initial acceptance than previous papers making more general claims about game-based learning. In addition, because of the careful stratified sampling approach, this study presents a refined view on the general uptake of video games in teacher education. Based on the descriptive statistics, it is apparent that more preservice teachers have played games before but not specifically in their teaching and learning. The low adoption rate is in stark contrast with some of the figures raised in Sandford et al. (2006) and Wastiau et al. (2009). This could point to regional differences as most preservice teachers in the developed world are highly conversant with using commercial video games in educational practices. Another possible explanation is that educational games researchers' perspective is biased, because of their more frequent contact with teachers who are participating in projects involving game-based learning (Bourgonjon et al., 2013). This paper also contributes to a body of research that examines the use of the technology acceptance model and theory of reasoned action and planned behaviour to explain technology adoption in educational settings. Most notably, this study found that preference did not explain behavioural intention very well. This contradicts an important hypothesis in some game acceptance studies (e.g., Bourgonjon et al., 2013). While it could be the respondents' believed that professional requirements and external expectations outweigh personal likes or dislikes, it is remarkable that subjective norms play a larger role than personal preferences (Shin, 2010). This shift indicates that the adoption of technological tools like commercial video games may now be driven more by practical considerations, such as perceived usefulness or external pressures, than by personal preference. This could be an indication of sampling bias. More research is required to explore the precise role of preference among samples of different category of respondents within an educational context. This study underlines the importance of social influences (subjective norm) on the acceptance of commercial video games among preservice teachers in colleges of education. This corresponds to Theory of Reasoned Action (Fishbein & Ajzen, 1975), as well as with earlier studies within related game-based learning acceptance research (e.g., Hsu & Lu, 2004; Bourgonjon et al., 2013).

Implications for Practice

The strong effect of Experience on Intention suggests that providing pre-service teachers with hands-on opportunities to experiment with commercial video games is essential. Previous studies have similarly emphasized the importance of direct experience in reducing anxiety and increasing confidence with technology use (Schepers & Wetzels, 2007). Therefore, teacher training should prioritize workshops and practical sessions over theoretical instruction to enhance technology adoption. Additionally, the influence of Learning Opportunity (perceived usefulness) highlights the importance of demonstrating the educational benefits of commercial video games in teacher training. Studies on e-learning have shown that perceived usefulness is one of

the strongest predictors of adoption (Cigdem & Topcu, 2015). Thus, providing clear evidence of the pedagogical advantages of game-based learning can improve adoption rates. Moreover, the significant effect of Subjective Norm on Intention implies that institutions should foster environments where the use of commercial video games is encouraged and supported by peers and mentors. Similar findings in healthcare contexts have shown that social pressures are powerful drivers of technology adoption (Pan et al., 2018). Institutions could implement peer-mentoring or collaborative learning groups to promote the integration of commercial video games into teaching and learning.

Limitations and Future Research Suggestions

Several limitations must be considered in this study. First, the sample consisted solely of pre-service teachers, limiting the generalizability of the findings to in-service teachers or other educational professionals in sub-Saharan college context. Future research could investigate how these relationships hold among practicing teachers who may have different motivations and constraints. Furthermore, while Preference was not found to be a significant predictor of Intention in this study, future research could examine how personal preference plays a role in other, more voluntary or informal contexts of game-based learning adoption.

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