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An Assessment of Google Classroom Reception and Usage among Pre-service Science, Technology and Mathematics Teachers in South-West Nigeria

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Abstract: An Assessment of Google Classroom Reception and Usage among Pre-service Science, Technology and Mathematics Teachers in South-West Nigeria. Objectives: The present study assessed google classroom reception and usage among preservice Science, Technology, and Mathematics (STM) teachers in south-west Nigeria. **Methods:** The participants were 480 preservice STM teachers purposively selected from four universities in south-west Nigeria within the blueprint of a correlational survey research design. Data analysis was carried out using mean, standard deviation, Pearson product moment correlation coefficient and multiple regression analysis at 5% level of significance. **Findings:** Results showed that 94.1% of the variance in preservice STM teachers' actual use of google classroom was accounted for by a combination of attitude towards use, perceived ease of use, perceived usefulness, and behavioural intention to use google classroom. **Conclusion:** Conclusively, STM teachers' educator should promote the adoption and utilization of google classroom among the preservice STM teachers to increase their reception of google classroom for instructional purposes.

Keywords: reception, google classroom, Technology Acceptance Model, preservice teachers.

Abstrak: Asesmen Penerimaan dan Penggunaan Google Classroom di antara Calon Guru Sains, Teknologi, dan Matematika di Nigeria Barat Daya. ***Tujuan:*** *Penelitian ini menilai penerimaan dan penggunaan kelas google di antara calon guru Sains, Teknologi, dan Matematika (STM) di Nigeria Barat Daya.* ***Metode:*** *Para peserta adalah 480 calon guru STM yang dipilih secara purposive dari empat universitas di Nigeria Barat Daya dalam cetak biru desain penelitian survei korelasional. Analisis data dilakukan dengan menggunakan mean, standar deviasi, koefisien korelasi product moment Pearson dan analisis regresi berganda pada taraf signifikansi 5%.* ***Temuan:*** *Hasil penelitian menunjukkan bahwa 94,1% variansi penggunaan aktual google classroom oleh calon guru STM disebabkan oleh kombinasi attitude towards use, perceived ease of use, perceived usefulness, and behavioural intention untuk menggunakan google classroom.* ***Kesimpulan:*** *Secara konklusif, pendidik guru STM harus mempromosikan adopsi dan pemanfaatan google classroom di antara calon guru STM untuk meningkatkan penerimaan mereka terhadap google classroom untuk tujuan pengajaran.*

Kata kunci: *penerimaan, google classroom, Model Penerimaan Teknologi, calon guru.*

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INTRODUCTION

Google classroom is a widely acclaimed Web 2.0 digital technology that enables a seemingly thought-provoking amenities and applications. Similar to other Web 2.0 digital technologies, Google classroom has a potential benefit for digital instruction simply because of its exceptionally integrated functions that enable educational engagement, communal and high-tech affordances (Wang, Woo, Quek, Yang, & Liu, 2012). Google classroom is a novel platform hosted in Google Apps for Education in 2014. This emerging classroom system helps teachers to create a profoundly more collaborative learner-centred digital classroom that promotes teaching and learning with constantly efficient feedback that enables radical progress in class communication with ease. As a free web service for schools, google classroom is developed to streamline pedagogical communications between the teacher and the students in a paperless mode. Google classroom is a combination of many google apps such as google drive for producing and allocating assignment, google docs, sheets and slides for writing, g-mail for communication and sending messages, and google calendar for scheduling and planning class activities. Interestingly, google classroom is one-stop cloud-based learning platform for simplifying digital production, workflow, and pedagogical communiqué between educators and learners. With google classroom, learners become authority in their own learning, remove the technological anxiety dimension and connect through global interchange programme thus offering eccentric learning prospects like after-school programmes and workshops for adult students. The use of google classroom by teachers is becoming increasingly popular in academic literature. However, there is a relatively low empirical studies investigating how often and what variables affect a teacher's preference to using this platform in the course of his/her pedagogical nuance of teaching. The affinity for teachers to adopt resources that are available and easy to get and their choice for one-slot pedagogical product, all facilitate the continual adoption of online or cloud-based digital learning platforms like google classroom (Shaharanee, Jamil, & Rodzi, 2016; Wang, Woo, Quek, Yang, & Liu, 2012).

Few available studies by researchers (Shahanee et al., 2016) have attested to the fact that google classroom is a user-friendly cloud-based teaching and learning platform for teachers and students, promoting access to engage in pedagogical communications. However, there is this apprehension that google classroom may draw students away from conventional face-to-face classrooms to virtual learning which is fast becoming ubiquitous. In spite of the current debate on the impact google classroom has on students' performance and teachers' efficiency in teaching, researchers have carried out very scanty user studies investigating google classroom (Al-Maroof & Al-Emran, 2018); no empirical studies have examined teachers' present adoption of the learning platform, or their acuities of its efficacy and practicality in Nigeria. This study is envisioned to increase literature on the variables that affect a teacher's resolution to adopt google classroom for teaching. As a vital and expedient resource, google classroom has the unique features of existing as a free emerging cloud-based digital learning platform listed on the web; and a paperless platform seen to compete with traditional face-to-face classroom often criticized by some 'techno-optimist' for not being paperless to revolutionise education to the point of promoting student engagement, liberalising access and increasing performance (Galway, Corbett, Takaro, Tairyan, & Frank, 2014; Siemens & Tittenberger, 2009). By concentrating on pre-service teachers, this study strives to comprehend how future teachers assess google classroom in pedagogical discourse so that educators can deliver more unique services for this set of

learners. Comprehending the features that affect pre-service STM teachers to receive and finally use google classroom for teaching and learning is undoubtfully vital for STM educators mounting a learner-centred curriculum. It is extremely difficult for STM educator to gauge pre-service STM teachers' usage of google classroom, since pre-service STM teachers may access the learning platform from home and never connecting to the university website. Getting to know the number of times pre-service STM teachers engage the use of learning platform can be provided by platform providers but they cannot offer beneficial info concerning the authentic experience of the user. This restriction means that STM educators may not understand why some pre-service STM teachers choose some learning platforms over others. In this study, we examine which variables have the robust influence on a pre-service STM teacher's intent to receive a learning platform, consequently making plans for the types of features that have the highest influence on promoting loyalty and adoption of other platforms.

While it is imperative to recall that teachers' role in the effective deployment of google classroom in education cannot be undermined as they remain the chief protagonists of google classroom adoption in education, research studies are yet to focus on the elements that affect the utilization of google classroom in the pedagogical discourse and process. Thus, securing a profound understanding of the interplay of factors in google classroom use in education could help in the growth of suitable methods to enriching the adoption of google classroom in the pedagogical discourse. The determinants such as perceived usefulness and perceived ease-of-use widely proclaimed in the Technology Acceptance Model (TAM) (Davis 1989) are yet to be examined as antecedents of google classroom adoption in education in the Nigerian context. Going by the current phenomena in the existing literature, this paper examines a model of four precursors of google classroom use in education within the Nigerian context.

Google classroom, broadcasted in May 6, 2014, and made public on August 12, 2014, is a cloud-based digital platform that incorporates Google Apps to create digital classroom needed essentially to design, disseminate, and grade assignment in a paperless way and for students to engage in pedagogical dialogue with their teachers and colleagues. Google classroom provides a unique opportunity for exemplifying students-teacher pedagogical communication and the simplicity of allocating and scoring assignments online within the time limit. It affords teachers the opportunity to have a holistic picture of the improvement of each student, and they can provide instant feedback on each student work needing revision anywhere and anytime. Google classroom as a pedagogical tool positions the traditional teacher as a facilitator in which learning becomes student-centred (Awofala & Lawani, 2020) and students are actively wide-open to investigation, discourse, higher-order critical thinking skills, and problem-solving skills that enable data mining (Okunuga, Awofala & Osarenren, 2020). The suppleness and influence of google classroom technology can provide an enabling environment for educational institutions to build an efficiently functional and available learning bionetwork capable of engaging the international learning ecosystem. Teachers may show resistance in using the google classroom as it requires them to experiment with novel pedagogy and mounting new curriculums that give students the chance to actively engage in the learning of generic or soft skills which are most sought after by employers of labour (Awofala, Olabiyi, Ogunleye, Udeani & Fatade, 2017; Awofala, Ojo, Okunuga, Babajide, Olabiyi, & Adenle, 2019).

Since google classroom first appearance, many published articles by researchers have investigated its positives and negatives, while the user experience is generally overlooked. E-Learning industry provides several advantages of using google classroom to include: quick to learn and ease of use, general device availability, student quick feedback on assignment, and the paperless system it offers thereby promoting both the students' and the teachers' competency in using technology in this twenty-first century. Google classroom frequently bewailed disadvantages include: absence of computerized quizzes and tests, absence of live charts or video conferencing that can help in feedback efforts and unauthorized data mining of students' surfing history and explorations for marketing. Diverging views about the efficiency and respect for student privacy of google classroom have increased the misunderstanding on how universities should use this e-classroom and how teacher educators could adopt pre-service teachers' hunger for public broadcasting to enrich pedagogical discourse. Heggart and Yoo (2018) investigated the efficiency of adopting google classroom for senior preservice primary teachers to inspire learners' voices and intervention, and to determine the impact of the learning platform on prospective instructions at the university level. Results indicated that google classroom amplified learners' involvement and erudition and enriched teaching space diminuendos. While the study showed worries about pace and user experience, it pinpoints four constructs (learner voice/agency, pace, collaboration and ease of access) that investigate the efficacy of other virtual digital learning platforms, in connection with didactical preparation. DiCicco (2016) examined the effects of google classroom on teaching social studies for six 7th graders with learning disabilities, attending a resource classroom. The results showed that while google classroom improved students' scores in vocabulary development, it demonstrated restricted growth in learning content of social studies paralleled to adopting textbook and published material as education resources. Results also indicated that both the teachers and the students had positive perceptions about the integration of google classroom into the teaching and learning of social studies.

Davis (1986) in his Doctoral thesis, established the Technology Acceptance Model (TAM) as a means to explicate user's intention to accept and implement technology. Five main precursors of technology acceptance are recommended, specifically, perceived usefulness (PU), perceived ease of use (PEOU), attitudes toward use (ATU), behavioural intention (BI), and actual use (AU). These determinants are essential to the individuals and are more amenable to the instructional setting in which PU, PEOU, and ATU are regarded as predictors for BI and AU and that the factors PU and PEOU are the most dominant rudiments of the model (Toland, White, Mills, & Bolliger, 2014). Perceived usefulness is described as the extent to which a user is certain and trusts that a particular technology will enrich his/her performance (Davis et al., 1989). Research studies have shown that teachers' perception of invention is critical to fruitful deployment of technology in learning (Watson, 2006) and teachers will adopt technology, if they hold the definitive belief that they will get anticipated advantages by deploying it (Bhattacherjee, 2001; Benett & Benett, 2003). Teachers' beliefs and their unwillingness or resistance to use technology are the two most vital factors which could hinder the use of new technology (Benett & Benett, 2003). Perceived ease of use is described as the propensity to which a person holds the belief that adopting a specific technology would be comparatively devoid of effort (Davies, 1989). Thus, in this setting, educators' perceived ease of use toward

google classroom is seen as a decisive determinant in its usage in the instructional context. Teachers' capability, aptitudes, and proficiencies in adopting computer technology make usage of technology copiously easy (Watson, 1993) and teachers' perceived ease of use has a direct relationship with their deployment of technology in the pedagogical process (Chong, Sharaf & Jacob, 2005). More so, tutors' perceived ease of use of technology is a decidedly influential element in the preparation of teaching materials in school (Askar, Usluel & Mumcu, 2006) and in their quest to successfully incorporate and diffuse technology in the teaching and learning process (Andoh, 2012; Simonson, 2008). Behavioural intention to use google classroom is designated as the degree to which a preservice teacher has established sensible strategies to carry out or not to do certain definite impending behaviour. Attitude toward use is the preservice teacher evaluation of the attraction of adopting and utilizing google classroom.

Presently, the TAM is implemented for gauging the preservice STM teachers' reception of google classroom as a tool to be maximized in everyday educational lesson. Hence, the TAM offers a strong context for the efficacy of a novel technology. In addition, the TAM as well advocates that when preservice STM teachers are treated to a novel technology various features can impact their reception verdict. Thus, the following research questions guided this study.

RQ1. What is the association between perceived usefulness, perceived ease of use, attitudes toward use, behavioural intention, and actual use of google classroom among preservice STM teachers?

RQ2. What is the predictive contribution of perceived usefulness, perceived ease of use, attitudes toward use, and behavioural intention to the explanation of variance in preservice STM teachers' actual use of google classroom?

METHODS

Research Design

The study deployed the numerical scheme of a correlational research design (Awofala, Lawal, Arigbabu & Fatade, 2020).

Participants

The study sample consisted of senior preservice STM teachers in Nigeria with diverse backgrounds, teaching subjects and cumulative grade point average. The major benchmarks in selecting the participants were being preservice STM teachers, who have been exposed to google classroom and use it for educational purposes. The purpose of the study and the criteria for selecting the participants were explained to them. All participants were communicated that their involvement in the study was intended and anonymous. The participants consisted of 480 seniors prospective STM teachers (230 females and 250 males) from four degrees awarding institutions in Southwest Nigeria. The age of the participants ranged from 19 to 28 years ($Mean_{age}$ = 21.5 years; SD=1.6 years).

Instrument

The investigation used a survey strategy to assemble data associated with BI, PEOU, PU, ATU, and AU. In a bid to guarantee content validation, survey items were revised from prevailing TAM researches (Al-Maroof & Al-Emran, 2018; Davis, 1989) that showed definite proof of soundness and consistency. Based on the purposes of the study, alterations were made on the survey items to conform with the context of the study.

The survey composed of two key aspects. The first aspect contained biodata connected with the respondents' age, gender, discipline of study and level of study. The second aspect of the survey contained 17 TAM associated items as displayed in the Table 1 below together with reliabilities confirmed with Cronbach alpha.

Table 1. Cronbach's alpha (CA), composite reliability (CR) and average variance extracted (AVE)

Construct	No of items	CA	CR	AVE
BI	2	0.94	0.96	0.92
ATU	3	0.89	0.91	0.85
PU	5	0.90	0.92	0.83
PEOU	5	0.95	0.96	0.86
AU	2	0.92	0.93	0.84

The items of each construct were rated on a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5).

Procedure

The future STM teachers were stimulated to fill the survey after suitable endorsements had been given and informed consent returned. The researchers and four research subordinates aided in the distribution of the survey to the chosen respondents. Intentional involvement and anonymity were encouraged and no one was punished for not partaking in the study. Two weeks were used for the data collection.

Data Analysis

Vital information on the constructs of the study collected through the survey were coded on the SPSS version 25 and the two research questions for the study were answered using standard deviation, mean, Pearson product-moment correlation coefficient and multiple regression analysis. Tests of statistics were conducted at 5% level of significance.

RESULT AND DISCUSSIONS

Research Question one: What is the association between perceived usefulness, perceived ease of use, attitudes toward use, behavioural intention, and actual use of google classroom among preservice STM teachers?

In Table 2 below the results of the correlations among PU, ATU, PEOU, BI and AU of google classroom for instructional purposes are exhibited. It was shown that there was a weighty positive and meaningful association between the preservice STM teachers' AU and PU (r=.614, $p<.01$), ATU (r=.506, $p<.01$), PEOU (r=.537, $p<.01$), and BI (r=.584, $p<.01$). Also, there were significantly positive associations between PU and ATU (r=.625, $p<.01$), PEOU (r=.734, $p<.01$), and BI (r=.548, $p<.01$). More so, there were statistically weighty correlations between ATU and PEOU (r=.348, $p<.01$), and BI (r=.416, $p<.01$). In addition, there were statistically weighty association amid PEOU and BI (r=.289, $p<.01$).

Table 2. Correlations matrix for the relationship between PU, ATU, PEOU, BI and AU of google classroom

	1	2	3	4	5
1. AU	1				
2. PU	.614*	1			
3. ATU	.506*	.625*	1		
4. PEOU	.537*	.734*	.348*	1	
5. BI	.584*	.548*	.416*	.289*	1
Mean	8.28	21.86	12.82	22.08	8.63

SD	2.48	4.37	3.10	4.22	2.49
N	480	480	480	480	480

*Correlation is significant at the .01 level (2-tailed).

Research Question two: What is the predictive contribution of perceived usefulness, perceived ease of use, attitudes toward use, and behavioural intention to the explanation of variance in preservice STM teachers' actual use of google classroom?

Table 3 below showed the joint and relative contributions of ATU, PU, BI, and PEOU to the prediction of AU among preservice STM teachers. The table showed that the R-value of 0.970 in the study demonstrates a simple high association. Therefore, 94.1% which shows the R^2-value defined the combined influence of the independent variables (ATU, PU, BI, and PEOU) to the prediction of preservice STM teachers' AU to adopt and utilize google classroom for educational purposes. The proportional input is substantial with F value of 907.624 at 5% level of significance. Thus, showing that the regression equation is fitted by the data.

Table 3. Model summary, coefficient and t-value of multiple regression analysis of ATU, PU, PEOU, BI and AU

Model summary					
Multiple R= .970; Multiple R^2= .941; Multiple R^2 (Adjusted)= .938					
Standard Error Estimate= 5.056; F=907.624; p<.001; df1=4; df2=475					
Model	**B**	**Std Error**	**Beta**	t	Sig
Constant	11.73	.522		14.245	.000
BI	4.062	0.21	0.453	14.478	.000
PU	6.564	.064	2.967	20.162	.000
ATU	5.254	.674	2.543	18.147	.000
PEOU	3.046	.134	0.245	12.478	.000

Using Table 3 as a template for analyzing the relative contribution, it was shown that PU was the finest meaningful forecaster of AU of google classroom among the preservice STM teachers ($\hat{a}$ = 2.967, t = 20.162, p=.000), followed by ATU ($\hat{a}$ = 2.543, t = 18.147, p=.000), and followed by BI ($\hat{a}$ =0.453, t = 14.478, p=.000). PEOU recorded the smallest statistically significant and symbolic contribution to the forecast of AU of google classroom among preservice STM teachers ($\hat{a}$ = .245, t = 12.478, p=.000). The present study revealed that the regression equation is shown by AU of google $\text{classroom}_{\text{predicted}}$=11.73 + 4.062 BI + 6.564 PU + 5.254 ATU + 3.046 PEOU of google classroom for educational purposes.

This investigation was carried out to explicate the elements that impacted the reception of google classroom among preservice STM teachers in south-west Nigeria. Using the TAM hypothetical viewpoint, the belief constructs of PU and PEOU, and their associations with ATU, BI and AU were investigated. No uncommon results were established concerning the TAM paradigms, therefore, positively corroborating the pertinency of TAM in Nigerian university milieu. Additionally, the two research questions in the study were answered as the preservice STM teachers did not find google classroom difficult to use and this clearly shows that the easier preservice STM teachers see google classroom to be, the more they will perceive it usefulness.

More so, ATU of the enacted google classroom could be supplementarily strengthened as much as it is premeditated to offer value. The present study results were in consonance with prior research (Toland, White, Mills, & Bolliger, 2014; Gamble, 2017) carried out showing the identical nature of how preservice STM teachers perceive google classroom for educational purposes in Nigeria.

More so, the present study revealed the efficacy of ATU, PU, PEOU and BI in significantly predicting preservice STM teachers AU of google classroom in the Nigerian milieu. In short, these predictive elements contributed more than 90% of the variation in preservice STM teachers' AU of google classroom for educational purposes in Nigerian higher education classrooms. The study revealed the dominancy of PU in meaningfully forecasting AU of google classroom for educational purposes among preservice STM teachers and this result was in tandem with the results of Siyam (2019) but at variance with the results of Gamble (2017) who found that ATU was the best predictor of AU among higher education students in Japan. ATU was the second biggest predictor of AU of google classroom among preservice STM teachers in south-west Nigeria. Since attitude determines the altitude, preservice STM teachers' ATU their disposition towards google classroom use. In actual fact, any preservice STM teacher that shows skillfulness in actual use of google classroom will definitely show an enhanced ATU towards google classroom use.

Also in this study, PEOU is a strong determinant of preservice STM teachers' AU of google classroom for educational purposes in south-west Nigeria. The preservice STM teachers see google classroom as a flexible technology that is easy to learn, easy to understand and adopt and easy to use for educational purposes. These pointers of PEOU are effective in promoting preservice STM teachers' AU of google classroom for instructional purposes in Nigeria. The degree to which the preservice STM teachers perceived how easy it is to use the google classroom influenced their AU of google classroom in the higher education classroom context. It is confirmed in this study that BI is a strong antecedent of AU of google classroom among the preservice STM teachers in Nigeria. Thus, BI had a strong influence on the initial interest to adopting and use google classroom which is a new technology in the Nigerian context.

■ CONCLUSIONS

This study showed the efficacy of four antecedents in predicting preservice STM teachers AU of google classroom in south-west Nigeria. Among the antecedent, PU had the greatest influence on preservice STM teachers' AU of google classroom for educational purposes. This was followed by ATU and the least determinant of AU of google classroom for educational purposes was BI. PEOU was a better forecaster of AU of google classroom enactment in higher education classroom. The present study model accounted for 94.1% of the variance in AU of google classroom for educational purposes among preservice STM teachers in south-west Nigeria. The numerical strength of the predictors of preservice STM teachers' AU of google classroom for educational purposes in the higher education context in south-west Nigeria is expressed as follows: PU >ATU >PEOU >BI. The present study was carried out in one geo-political zone out of the six geo-political zones in Nigeria thereby precluding the generalization of the study findings to other zones of Nigeria. Thus, the present findings should be treated with utmost caution.

Moreover, attention was mainly focused on the critical elements of TAM without considering other external elements such as perceived resources, anxiety, accessibility and preservice STM teachers' familiarity and perceived social

influence with google classroom in the study. Future studies should consider these elements and investigate their influence on actual use of google classroom for educational purposes. In conclusion, preservice STM teachers' educators should promote the adoption and utilization of google classroom among the preservice STM teachers to increase their reception of google classroom for instructional purposes.

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