

## DIGITAL COLLABORATIVE LEARNING PLATFORMS FOR STUDENTS' LEARNING OUTCOMES IN PRIVATE UNIVERSITIES IN RIVERS STATE

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### ABSTRACT

This study investigated digital collaborative learning platforms for students' learning outcomes in private universities in Rivers State. Three objectives, three research questions and three hypotheses guided the study. The study adopted descriptive survey design. The population of this study was 397 consisting of 74 lecturers and 323 students from Pamo Medical University and Wigwe University, Isiokpo, Rivers State. The sample size of 269 consisting of 46 lecturers and 223 students from Pamo Medical University and Wigwe University, Isiokpo, Rivers State was derived using simple random sampling technique. The instrument of the study was a self-developed questionnaire titled: "Digital Collaborative Learning Platforms for Students' Learning Outcomes Questionnaire" which was face and content validated by two experts in Measurement and Evaluation and Department of Educational Management. Cronbach Alpha was used to establish the reliability of the instrument which yielded reliability indexes of .84, .87 and .80. Mean and standard deviation were used to answer the research questions while z-test was used in testing the formulated null hypotheses at .05 level of significance. Findings of the study revealed that to a high extent digital collaborative learning platforms such as Google classroom, Microsoft Teams and WhatsApp enhance students' learning outcomes in private universities in Rivers State. Based on the findings, it was recommended among others that school management should ensure lecturers are trained in the use of Google classroom and are also encouraged to utilize it continuously as it has the potential to enhance students' learning outcomes.

**Keywords:** Digital Collaborative Learning Platforms, Students' Learning Outcomes, Google Classroom, Microsoft Teams, Whatsapp.

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## INTRODUCTION

Education is crucial for the advancement of human civilization. Amie-Ogan and Epelle (2021) defined education as a process by which abilities and capabilities of individuals are developed for the actualization of human potential to enable transformation of individuals and nations in a broader view. Since ancient times, teaching and learning have taken place in traditional face-to-face method where education is imparted within the walls of classrooms to a group of students. With the introduction of internet and digital technology, the online learning platforms are trending slowly and surely taking the place of classrooms (Mircea, 2023). Thus, the modern education system has completely eradicated the space limitation of a classroom by encouraging the participation of more students from every corner of the world. The methods of teaching and learning have continually evolved and changed due to technological advancement. According to Vimal (2022), the provision of knowledge through online platforms or websites have enabled the modern education system to attract a variety of students and teachers to participate in technology-based learning free from any kind of limitations of time, space or number of students. The quest for educational development now makes it imperative for the teaching and learning process to shift from the existing traditional method of teaching to accommodate the use of digital technologies to improve students' learning outcomes.

The development of the times requires the world of education to adapt to technological developments to improve the quality of education, especially students' learning outcomes. Students' learning outcomes refers to the desired learning objectives or standard that students are expected to achieve. Oregon State University (2025) defined students' learning outcome as measurable statements that specify the knowledge, skills, attitudes or values students are expected to acquire and demonstrate upon completing a course, programme or learning activity. When students meet the expectation of a learning programme, then such students are said to have positive learning outcome, while the reverse is the case when students' expectations are not met. Also, students' learning outcome have been articulated to include the ability of students to understand content taught in a clear and understandable manner, been able to have appropriate, relevant and timely communication with the instructor, ability to acquire theoretical and practical knowledge, and the ability to think critically (UNESCO, 2023).

Digital collaborative learning platforms are currently being incorporated into the Nigerian educational system, offering the potential to revolutionize teaching methods and enhancing the learning experience for students. Uzuegbunam (2019) asserted that Nigeria is one of the African countries with the highest and consistently growing technological penetration. Digital collaborative learning platforms have evoked a seismic shift in the ways children learn and communicate in the classroom. This is because they have been exposed to digital technologies right from birth and are the most regular users of online and digital services. Many students today acquire information daily by using digital tools such as computers, laptops, tablets, internet and mobile phones and this has significantly impacted the way they learn. Prensky (2011) noted that teaching this type of learners with the traditional face to face method would pose a lot of challenges because the school is supposed to prepare them for a world of work that is highly digitalized. However, with the integration of digital collaborative learning platforms, education can become more personalized and adaptive, catering for the unique requirements of each student. This learning approach allows for the delivery of customized and collaborative content, recommendations and feedback, providing students with a tailored learning experience that improve their learning outcomes.

Digital collaborative learning platforms refers to virtual spaces where instructors and learners interact, access educational content and engage in collaborative learning activities. Picciano (2017) defined digital collaborative learning platforms as technology-driven systems that provide structured environments for education, training and resources to integrating various digital tools to facilitate learning. Digital collaborative learning platforms encompass a range of technologies, including Learning Management Systems (LMS), Virtual Learning Environments (VLE) and adaptive learning systems, all designed to enhance educational delivery and support different instructional methodologies (Bozkurt et al., 2020). These learning platforms provide learners with access to multimedia content, discussion forums, assessments and other interactive elements that make education more engaging and accessible. According to Jiao et al. (2022), digital collaborative learning platforms are integrated set of interactive online services that provide teachers and learners with information, tools and resources to support and enhance education delivery and improve learning outcome of students. Digital collaborative learning platforms have a huge influence on the learning outcomes of students. Parveen and Ramzan (2024), asserted that today's children are highly accustomed to using electronic gadgets, integrating digital collaborative learning platforms into education can capture their interest and increase their involvement. Students can download necessary information and upload their content which enhance their engagement in learning. Mircea (2023) noted that digital collaborative learning platforms include Google classroom, Microsoft Teams, WhatsApp etcetera, which help to improve students' learning outcomes.

Google classroom is one of the modern teaching technologies introduced in 2014 as a platform for web-based classroom. Google classroom is a collaborative teaching tool that combines the Google drive and other services to create an informative educational environment. Google classroom features communication and discussion tools such as online debates, forums, reviews, brief messages and emails, allowing students to engage in collaborative learning which can be used for teaching and learning. Google classroom can be used to organize and manage assignments, foster collaboration and provide personalized feedback. Google classroom may be considered one of the inquiry-based learning media since it can fully engage students' talents in finding, understanding, exploring, analyzing, and formulating learning outcomes (Ghofur, 2018). This helps the students to find out information for themselves which may help increase their level of learning engagement and consequently achievement. Sri Sasmita et al. (2021) stated that the use of google classroom may be captivating and interesting to students because of its personalized learning nature. The perceived interest of students may cause them to become engrossed in the teaching and learning. This may help in their retention of concepts which would culminate in an improvement of their learning outcomes.

Henukh et al. (2020) opined that google classroom increase students' participation in learning and improve classroom dynamics. It also allows students to work through problems or assignments at their own pace while still receiving support and guidance when necessary. Students could become self-directed as it produces a learning environment that improves students' knowledge and skills in the subject area (Hemrungrote & Jakkaew, 2016). In addition, when students submit their assignments, the application web-based feature can highlight the contents of each assignment and provide the students with instant constructive feedback, as well as evaluate their performance. More so, the platform creates a space for private comment for students to interact with an Artificial Intelligence (AI) enabled feature on things relating to the subject area which makes learning interesting and enjoyable. According to Rodrigo (2023),

Google classroom assist in identifying pupils who are having difficulty learning and in providing them with additional support to boost their overall learning outcome.

Another digital collaborative learning platform is Microsoft Teams. With the growing integration of technology in higher education, digital platforms like Microsoft Teams have become indispensable for creating an effective virtual learning environment that complements traditional classroom instruction. According to Pane et al. (2015), Microsoft Teams, as a digital collaborative learning platform improve students' learning outcomes by fostering interactive engagement, facilitating seamless communication, supporting diverse learning styles and enhancing accessibility to learning resources. Microsoft Teams enhances students' learning outcomes through improved engagement and collaboration. Studies have shown that student engagement is a critical factor in academic success. Microsoft Teams provides a dynamic space where students can actively participate in discussions, collaborate on assignments in real-time and engage in peer learning through group chats and video conferencing (Kahu, 2018).

The platform's ability to integrate with tools such as Microsoft OneNote, SharePoint and third-party educational apps allow students to work together on projects more efficiently. This fosters a sense of community among learners, which has been linked to increased motivation and academic performance (Tinto, 2017). Means et al. (2018) asserted that Microsoft Teams enhances accessibility and flexibility in learning, which is particularly beneficial to students in universities who may have different schedules and learning preferences, thus enhancing their learning outcomes. The platform supports asynchronous learning by enabling students to access recorded lectures, shared files and discussion threads at their convenience. This feature is crucial for students who may miss live lectures due to personal or professional commitments. Additionally, Microsoft Team's integration with artificial intelligence-powered transcription services and immersive reader functions ensures that students with disabilities or language barriers can engage with the content effectively (Seale, 2023).

The integration of Microsoft Teams with various educational technologies also facilitates personalized learning experiences. Microsoft Teams allows instructors to create customized learning paths by utilizing features such as breakout rooms, individual assignments, and adaptive learning resources (Pane et al., 2015). This ensures that students receive tailored instruction that meets their specific academic needs, thereby enhancing comprehension and retention. Redecker and Punie (2017) opined that Microsoft Teams play a crucial role in fostering a collaborative and inclusive learning environment that prepares students for the digital workforce. Many employers now require proficiency in digital collaborative tools. Hence exposure of students to digital collaborative tools do not only improve students' academic performance but also enhances their employability prospects after graduation.

WhatsApp is a versatile instant digital technologies enabled collaborative learning platform that enables the exchange of text, voice, and video messages, in addition to supporting voice and video communication. According to Nyasulu and Dominic Chawinga's (2019), the utilization of WhatsApp yield several advantages such as the swift distribution of scholarly data, heightened engagement with both peers and lecturers and the encouragement of cooperative learning endeavours.

In corroboration, Amie-Ogan and Nwosu (2023) in their study found that the use of WhatsApp, Zoom and Video Conferencing have a positive relationship with lecturers' productivity in Public Universities in Rivers State. WhatsApp functions as a mechanism to facilitate group deliberations and cooperative educational endeavours amongst students. Wut and Xu (2021) stated that WhatsApp enhance students' engagement and motivation, while also

offering support for both formative and summative assessments. Another phenomenon that has been noted in the utilization of WhatsApp in academic settings is the utilization of WhatsApp groups as a strategy to promote collaborative learning. Jailobaev, Jailobaeva, Baialieva and Asilbekova (2021) conducted a recent study that found that WhatsApp groups are commonly employed to facilitate team projects, group discussions, and peer feedback. WhatsApp has a built in feature which serves the purpose of enhancing language acquisition, whereby students utilize the feature to refine their abilities in oral and written communication.

Utilizing WhatsApp as a digital technology enabled collaborative learning platform can play a crucial role in personalizing learning. The reason for this phenomenon is that students can access educational materials and obtain evaluations at their own convenience and preferred speed. Ajani (2022) asserted that the dominant trends observed in WhatsApp application include its use for purposes of communication, remote and virtual instruction, collaborative learning, and the implementation of flipped classroom pedagogy. WhatsApp is being employed to promote and enhance student involvement, drive, and autonomous acquisition of knowledge. This approach facilitates the transmission of text, voice and video messages, along with the provision of voice and video call services to enable students collaborate with their peers while carrying out an academic project and this enhance their learning outcome (Ajani, 2021). WhatsApp possesses the capability to augment student motivation by cultivating a sense of community and furnishing assistance, while enabling self-directed learning prospects.

### **Statement of the Problem**

In recent times institutions of learning and workplaces have continued to evolve from outdated teaching and learning methods as well as administrative practices to adopting digital collaborative tools that have profoundly changed the education and workplace landscape. Technologies such as Google classroom, Microsoft Teams and WhatsApp are digital collaborative learning platforms which improve the effectiveness of instructions in the class, motivate students' participation and enhance learning outcomes.

However, the usage of digital collaborative learning platforms is limited among teachers and students in Nigerian educational system (Ahmed et al., 2022). Personal observation also show that in most public universities teaching and learning still rely on the traditional face-to-face conventional method of didactic teaching whereby students are relegated to the status of mere receptacles of knowledge. This method does not encourage critical thinking, problem solving, collaboration, creativity and communication skills which are the part of the 21<sup>st</sup> century skills highly sought in workplaces. Also the course outlines are not adequately completed at the learning period, making it difficult for students to garner enough knowledge, skills and abilities that are supposed to prepare them for the world of work that is highly digitalized. This development calls for the educational sector to incorporate digital collaborative learning platforms to facilitate teaching and learning thereby improving the quality of education in the 21<sup>st</sup> century. The question now is, to what extent has digital collaborative learning platforms been used to enhance students' learning outcomes in private universities in Rivers State? It was against this backdrop that the study investigated Digital Collaborative Learning Platforms on Students' Learning Outcomes in Private Universities in Rivers State.

### **Purpose of the Study**

The purpose of this study was to investigate digital collaborative learning platforms for students' learning outcomes in private universities in Rivers State. Specifically, the study sought to:

- Examine the extent to which Google classroom as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State.
- Determine the extent to which Microsoft Teams as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State.
- Ascertain the extent to which WhatsApp as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State.

### **Research Questions**

The under listed research questions guided the study:

- To what extent does Google classroom as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State?
- To what extent does Microsoft Teams as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State?
- To what extent does WhatsApp as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State?

### **Hypotheses**

The following hypotheses further guided the study:

- There is no significant difference between the mean ratings of lecturers and students on the extent to which Google classroom as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State.
- There is no significant difference between the mean ratings of lecturers and students on the extent to which Microsoft Teams as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State.
- There is no significant difference between the mean ratings of lecturers and students on the extent to which WhatsApp as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State.

### **METHODOLOGY**

The study adopted descriptive survey research design. The population of the study was 397 consisting of 39 lecturers and 123 students from Pamo Medical University and 35 lecturers and 200 students from Wigwe University, Isiokpo, River State. The sample size of this study was 269 consisting of 23 lecturers and 62 students from Pamo Medical University and 23 lecturers and 161 students from Wigwe University, Isiokpo, River State; derived from simple random sampling technique. The instrument for the study was a self-developed questionnaire titled: "Digital Collaborative Learning Platforms for Students' Learning Outcomes Questionnaire (DCLPSLOQ)" which was structured on a four point rating scale of Very High Extent (VHE) with ranges of 3.50-4.00, High Extent (HE) with ranges of 2.50-3.49, Low Extent (LE) with

ranges of 0.50-2.49 and Very Low Extent (VLE) with ranges of 0.00-1.49. The instrument was face and content validated by two experts in Measurement and Evaluation and Department of Educational Management and tested for reliability using Cronbach Alpha statistics which yielded reliability indexes of .84, .87 and .80. Mean and standard deviation were used to answer the research questions with a criterion mean of 2.50. Items above 2.50 signified 'High Extent' while items below denoted 'Low Extent'. The hypotheses posed in the study were analyzed using z-test at .05 level of significance.

## RESULTS

**Research Question 1:** To what extent does Google classroom as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State?

Table 1: Mean and Standard Deviation Ratings of Lecturers and Students on the Extent Google Classroom as a Digital Collaborative Learning Platform Enhance Students' Learning Outcomes in Private Universities in Rivers State

S/N	Item	Lecturers N=46			Students N=223		
		Mean	SD	Decision	Mean	SD	Decision
1	Google classroom helps the students to find out information for themselves which may help increase their level of learning engagement	3.30	0.58	High Extent	3.25	0.72	High Extent
2	Google classroom makes students more actively engrossed in the teaching and learning which enhance their retention of concepts taught	3.11	0.53	High Extent	3.19	0.60	High Extent
3	Google classroom increases students' participation in learning and improve classroom dynamics which enhance students' learning outcomes	3.04	0.62	High Extent	2.77	0.50	High Extent
4	Google classroom provides students with instant constructive feedback, as well as evaluate their performance which improves students' knowledge and skills in the subject area	2.95	0.76	High Extent	2.69	0.69	High Extent
5	Google classroom assists in identifying pupils who are having difficulty in learning and in providing them with additional support to boost their overall learning outcome	3.09	0.65	High Extent	3.00	0.52	High Extent
<b>Grand Mean/SD</b>		<b>3.10</b>	<b>0.68</b>	<b>High Extent</b>	<b>3.09</b>	<b>0.72</b>	<b>High Extent</b>

Data on Table 1 above for research question 1, revealed that, items 1, 2, 3, 4 and 5 had mean values of 3.30, 3.11, 3.04, 2.95 and 3.09 with standard deviation values of 0.58, 0.53, 0.62, 0.76 and 0.65 for lecturers and mean values of 3.25, 3.19, 2.77, 2.69 and 3.19 with standard deviation values of 0.72, 0.60, 0.50, 0.69 and 0.52 for students. In summary, the result showed grand mean values of 3.10 and 3.09 which were above the criterion mean of 2.50, which indicated that, to a

high extent Google classroom as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State.

**Research Question 2:** To what extent does Microsoft Teams as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State?

Table 2: Mean and standard deviation ratings of lecturers and students on the extent Microsoft teams as a digital collaborative learning platform enhance students' learning outcomes in private universities in rivers state

S/N	Item	Lecturers N=46			Students N=223		
		Mean	SD	Decision	Mean	SD	Decision
6	Microsoft Teams enhance students' accessibility and flexibility in learning which improves their learning skills and knowledge	3.01	0.68	High Extent	3.11	0.52	High Extent
7	Microsoft Teams stimulate creativity and critical thinking which enhance students' comprehension skills about topics taught	2.78	0.51	High Extent	3.24	0.70	High Extent
8	The reference materials (e.g. internet articles, online videos etc) gotten through Microsoft Teams help students to understand topics taught better	2.50	0.59	High Extent	3.31	0.78	High Extent
9	Microsoft Teams allow students to easily share media and up-to-date materials thus improving their learning outcomes	3.16	0.62	High Extent	2.98	0.73	High Extent
10	Microsoft Teams give students opportunities to explore new ideas which help them find innovative solutions to complex problems	3.02	0.70	High Extent	2.68	0.69	High Extent
<b>Grand Mean/SD</b>		<b>2.89</b>	<b>0.72</b>	<b>High Extent</b>	<b>3.06</b>	<b>0.68</b>	<b>High Extent</b>

Data on Table 2 above for research question 2, revealed that, items 6, 7, 8, 9 and 10 had mean values of 3.01, 2.78, 2.50, 3.16 and 3.02 with standard deviation values of 0.68, 0.51, 0.59, 0.62 and 0.70 for lecturers and mean values of 3.11, 3.24, 3.31, 2.98 and 2.68 with standard deviation values 0.52, 0.70, 0.78, 0.73 and 0.69 for students. In summary, the result showed grand mean values of 2.89 and 3.06 which were above the criterion mean of 2.50, which indicated that, to a high extent Microsoft Teams as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State.

**Research Question 3:** To what extent does WhatsApp as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State?



Table 3: Mean and standard deviation ratings of lecturers and students on the extent Whatsapp as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State

S/N	Item	Lecturers N=46			Students N=223		
		Mean	SD	Decision	Mean	SD	Decision
11	WhatsApp assist students refine their abilities in oral and written communication thereby enhancing their language acquisition.	3.08	0.78	High Extent	2.90	0.72	High Extent
12	WhatsApp promotes self-directed learning among students which enhance their learning outcomes	3.13	0.61	High Extent	2.65	0.51	High Extent
13	WhatsApp offers support for both formative and summative assessments which enhance students engagement and learning outcomes	3.20	0.77	High Extent	3.09	0.73	High Extent
14	WhatsApp encourage swift distribution of scholarly data and heightened engagement among students which enhance their learning outcomes	2.73	0.63	High Extent	2.96	0.69	High Extent
15	WhatsApp facilitate group deliberations and cooperative educational endeavours amongst students which enhance their critical thinking.	3.31	0.79	High Extent	3.05	0.76	High Extent
<b>Grand Mean/SD</b>		<b>3.09</b>	<b>0.72</b>	<b>High Extent</b>	<b>2.93</b>	<b>0.68</b>	<b>High Extent</b>

Data on Table 3 above for research question 3, revealed that, items 11, 12, 13, 14 and 15 had mean values of 3.08, 3.13, 3.20, 2.73 and 3.31 with standard deviation values of 0.78, 0.61, 0.77, 0.63 and 0.79 for lecturers and mean values of 2.90, 2.65, 3.09, 2.96 and 3.05 with standard deviation values of 0.72, 0.51, 0.73, 0.69 and 0.76 for students. In summary, the result showed grand mean values of 3.09 and 2.93 which were above the criterion mean of 2.50, which indicated that, to a high extent WhatsApp as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State.

**Hypothesis 1:** There is no significant difference between the mean ratings of lecturers and students on the extent to which Google classroom as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State.

Table 4: z-test analysis of difference between the mean ratings of lecturers and students on the extent to which Google classroom as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State

Respondents	N	Mean	SD	Df	SL	z-cal.	z-crit.	Decision
Lecturers	46	3.10	0.68	267	0.05	0.91	$\pm 1.96$	No Significant Difference
Students	223	3.09	0.72					

Table 4 shows a summary of mean, standard deviation and z-test of difference between the mean ratings of lecturers and students on the extent to which Google classroom as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State. The z-test calculated value was 0.91 and the z-critical value was  $\pm 1.96$ , using 267 degree of freedom at 0.05 level of significance. Since the z-calculated value was less than the z-critical value of  $\pm 1.96$ , the null hypothesis was accepted. This implies no significant difference between the mean ratings of lecturers and students on the extent to which Google classroom as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State.

**Hypothesis 2:** There is no significant difference between the mean ratings of lecturers and students on the extent to which Microsoft Teams as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State.

Table 5: z-test analysis of difference between the mean ratings of lecturers and students on the extent to which Microsoft teams as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State

Respondents	N	Mean	SD	Df	SL	z-cal.	z-crit.	Decision
Lecturers	46	2.89	0.72	267	0.05	-0.73	$\pm 1.96$	No Significant Difference
Students	223	3.06	0.68					

Table 5 shows a summary of mean, standard deviation and z-test of difference between the mean ratings of lecturers and students on the extent to which Microsoft Teams as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State. The z-test calculated value was -0.73 and the z-critical value was  $\pm 1.96$ , using 267 degree of freedom at 0.05 level of significance. Since the z-calculated value was less than the z-critical value of  $\pm 1.96$ , the null hypothesis was accepted. This implies no significant difference between the mean ratings of lecturers and students on the extent to which Microsoft Teams as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State.

**Hypothesis 3:** There is no significant difference between the mean ratings of lecturers and students on the extent to which WhatsApp as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State.

Table 6: z-test analysis of difference between the mean ratings of lecturers and students on the extent to which Whatsapp as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State

Respondents	N	Mean	SD	Df	SL	z-cal.	z-crit.	Decision
Lecturers	46	3.09	0.72	267	0.05	-0.74	$\pm 1.96$	No Significant Difference
Students	223	2.93	0.68					

Table 6 shows a summary of mean, standard deviation and z-test of difference between the mean ratings of lecturers and students on the extent to which WhatsApp as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State. The z-test calculated value was -0.74 and the z-critical value was  $\pm 1.96$ , using 267 degree of freedom at 0.05 level of significance. Since the z-calculated value was less than the z-critical value of  $\pm 1.96$ , the null hypothesis was accepted. This implies no significant difference between the mean ratings of lecturers and students on the extent to which WhatsApp as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State.

## DISCUSSION OF FINDINGS

Findings on research question 1 on Table 1 revealed that, to a high extent, Google classroom as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State with grand mean values of 3.10 and 3.09. Hypothesis 1 on Table 4 revealed no significant difference between the mean ratings of lecturers and students on the extent to which Google classroom as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State with z-calculated value of 0.91 which was less than the z-critical value of  $\pm 1.96$ . These findings are in agreement with Sri Sasmita et al. (2021) who stated that the use of google classroom may be captivating and interesting to the students because of its personalized learning nature. Also in support, Ghofur (2018), asserted that Google classroom may be considered one of the inquiry-based learning media since it can fully engage students' talents in finding, understanding, exploring, analyzing, and formulating learning outcomes.

Findings on research question 2 on Table 2 showed that, to a high extent, Microsoft Teams as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State with grand mean values of 2.89 and 3.06. Again, findings on hypothesis 2 on Table 5 revealed that, there is no significant difference between the mean ratings of lecturers and students on the extent to which Microsoft Teams as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State with z-calculated value of -0.73 which was less than the z-critical value of  $\pm 1.96$ . These findings are in tandem with Pane, Steiner, Baird and Hamilton (2015), who stated that Microsoft Teams, as a digital collaborative learning platform improves students' learning outcomes by fostering interactive engagement, facilitating seamless communication, supporting diverse learning styles and enhancing accessibility to learning resources. Also in support, Means et al. (2018) asserted that Microsoft Teams enhances accessibility and flexibility in learning, which is particularly

beneficial for students in universities who may have different schedules and learning preferences, thus enhancing their learning outcomes.

Findings on research question 3 on Table 3 showed that, to a high extent, WhatsApp as a digital collaborative learning platform enhances students' learning outcomes in private universities in Rivers State with grand mean values of 3.09 and 2.93. Again, findings on hypothesis 3 on Table 6 revealed that, there is no significant difference between the mean ratings of lecturers and students on the extent to which WhatsApp as a digital collaborative learning platform enhance students' learning outcomes in private universities in Rivers State with z-calculated value of -0.74 which was less than the z-critical value of  $\pm 1.96$ . These findings corroborates with Wut and Xu (2021) who stated that, WhatsApp is employed to enhance student engagement and motivation, while also offering support for both formative and summative assessments. Also in support, Ajani (2021), opined that, WhatsApp application facilitates the transmission of text, voice and video messages, along with the provision of voice and video call services to enable students collaborate with their peers while carrying out an academic project which enhances their learning outcomes.

## CONCLUSION

Based on the findings of the study, it was concluded that digital collaborative learning platforms such as Google classroom, Microsoft Teams and WhatsApp enhance students' learning outcomes in private universities in Rivers State to a high extent. Through digital technologies, personalized learning programmes could be created that foster the development of unique skills bordering on students' specific strengths and interests.

## Recommendations

Based on the findings of the study, the following recommendations were made:

- School management should ensure lecturers are trained in the use of Google classroom and utilize it continuously as it has the potential to enhance students' learning outcomes.
- Microsoft Teams should be actively employed by lecturers to supplement the traditional classroom strategy in order to promote constructivist learning experience among students.
- Lecturers should use WhatsApp to have regular classes as this would increase students' motivation and interest in continuous learning with instant feedback on topics without clarity, as voice and video call services are fully in use.

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