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Teaching - Learning Environments and Digital Education Tools on Student's Academic Engagement

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A B S T R A C T

This study investigated the impact of teaching-learning environments and digital education tools on student engagement among secondary learners in the Province of Cotabato for the school year 2024–2025. Employing a purely quantitative design, the research aimed to assess the levels of teaching-learning environments, usage of digital tools, and dimensions of students' academic engagement. It also explored the relationships and predictive influences between these variables and documented the challenges faced by teachers in sustaining engagement along with their coping strategies. The data was collected from 300 teachers using a reliable self-made questionnaire (Cronbach's Alpha: .898, .972, .947). Statistical analyses included mean, Spearman rho, and multiple linear regression. Results indicated that student-centered learning, collaborative learning, real-world relevance, and scaffolded support were consistently practiced. Widely used digital tools included WordWall, Quizizz, Quizlet, Kahoot, and Mentimeter. Students demonstrated high levels of cognitive, affective, social, task-related, and communicative engagement. Among predictors, student-centered learning significantly influenced all dimensions of engagement, while collaborative learning and real-world relevance affected specific engagement types. Digital tools were significantly associated with engagement, with WordWall notably influencing task-related engagement. The findings can inform educational policy, teacher development programs, and digital education planning, particularly in culturally and geographically diverse learning environments.

Keywords: Teaching-Learning Environments, Digital Education Tools, Student's Academic Engagement

1. Introduction

Student academic engagement is increasingly challenged by factors like technological distractions, mental health issues, and socio-economic disparities. These contribute to decreased motivation, reduced classroom participation, lower focus, and declining academic performance.

An effective teaching-learning environment, enhanced by digital education tools, can significantly boost student academic engagement. The integration of technology in classrooms—such as interactive platforms, learning management systems, and virtual simulations—promotes active participation and personalized learning experiences (Bond et al., 2020).

Several studies have explored the impact of the teaching-learning environment and digital education tools on student academic engagement, demonstrating positive outcomes. For instance, Bond et al. (2020) emphasize that interactive digital tools—such as online quizzes, collaborative platforms, and virtual simulations—can significantly enhance engagement by making learning more accessible, interactive, and tailored to individual student needs.

Despite growing research on the positive effects of the teaching-learning environment and digital education tools on student academic engagement, several gaps remain. A major gap is the lack of longitudinal studies examining the long-term impact of these tools on sustained academic engagement and learning outcomes across diverse student populations (Wekerle et al., 2020).

The researcher's interest in studying the impact of the teaching-learning environment and digital education tools on student academic engagement stems from a commitment to improving educational experiences in the digital era. Driven by the increasing integration of technology in classrooms, the researcher aims to investigate how these tools can foster more engaging learning environments that address students' evolving needs, enhance motivation, encourage active participation, and improve academic performance.

Aim

This study aimed to explore the teaching learning environments and digital education tools on student's academic engagement among secondary students in the Province of Cotabato. Specifically, it answered the following questions:

1. What is the level of teaching-learning environments in terms of students-centered learning, collaborative learning, real-world relevance, and scaffolded support?

2. What is the level of the application of digital education tools in terms of Word Wall, Quizizz, Quizlet, Kahoot, and Mentimeter?

3. What is the level of students' academic engagement in terms cognitive, affective, social, task, and communicative engagements?

4. Is there a significant relationship between teaching and learning environments and students' academic engagement?

5. Do teaching-learning environments significantly influence on the students' academic engagement?

6. Is there a significant relationship between the digital-education tools and students' academic engagement?

7. Do digital education tools significantly influence the students' academic engagement?

Hypotheses

The following hypotheses were tested in this study.

1. There is no significant relationship between teaching learning environments and students' academic engagement.

2. Teaching-learning environments do not significantly influence on the students' academic engagement.

3. There is no significant relationship between the digital-education tools and students' academic engagement.

4. Digital education tools do not significantly influence on the students' academic engagement.

METHODS

Research Design

This study used a quantitative method. The goal was to leverage the strengths of both approaches, offering a more comprehensive understanding of the research problem (Creswell and Plano Clark (2017). Further, the Descriptive-Correlational Design was employed.

Population and Sampling

This study employed the purposive sampling techniques (Cochran, 2017) which meant that teachers were involved in the study of those who adopted digital educational tools in the class.

Instrument

The researcher utilized the self-made questionnaire in data gathering which was divided into three parts. To ensure the accuracy and consistency of the instrument, the questionnaire underwent a validity and reliability test, with the reliability measured using Cronbach's Alpha. The first part of the questionnaire focused on teaching-learning environments, second part of the questionnaire emphasized digital education tools, and third part of the questionnaire centered on student academic engagement. A Likert scale was used in determining the level of their responses.

RESULTS and DISCUSSION

Teaching-Learning Environments

The first research problem focused in determining the level of teaching-learning environments in terms of student-centered learning, collaborative learning, real-world relevance, and scaffolded support.

Level of Teaching-Leaning Environments

Table 1 presents the level of teaching-learning environment with a grand mean of 4.66, described as highly practiced. Results revealed that they are highly practiced on collaborative learning, real-world relevance, scaffolded support, and student-centered learning with different weighted mean levels.

The findings imply that teachers effectively integrate diverse instructional strategies that enhance student engagement and comprehension. The high level of teaching-learning environments across all dimensions emphasizes interactive and meaningful learning experiences, which can contribute to better student engagement and skill development.

These results align with educational literature emphasizing the benefits of an enriched teaching-learning environment. Gulland (2021), collaborative learning and scaffolded support enhance cognitive development by allowing students to build knowledge through social interactions. Additionally, Biggs and Tang (2018) highlighted the importance of real-world relevance in education, advocating for experiential learning to connect classroom instruction with practical application. Recent studies Al-Maroof et al (2020) further supported the effectiveness of student-centered learning in improving critical thinking and problem-solving skills. These findings reinforce the significance of enhancing diverse and interactive teaching-learning environments to optimize student engagement and academic success.

Table 1 Level of teaching-learning environments

Teaching-Leaning Environments	Weighted Mean	Description
Student-Centered Learning	4.59	Highly Practiced
Collaborative Learning	4.71	Highly Practiced
Real-World Relevance	4.68	Highly Practiced
Scaffolded Support	4.67	Highly Practiced
Grand Mean	**4.66**	**Highly Practiced**

Level	*Range*	*Description*
5	*4.21-5.00*	*Highly Practiced*
4	*3.41-4.20*	*Practiced*
3	*2.61-3.40*	*Moderately Practiced*
2	*1.81-2.60*	*Rarely Practiced*
1	*1.00-1.80*	*Very Rarely Practiced*

Application of Digital Education Tools

The second research problem focused in determining the level of the application of digital education tools in terms of Word Wall, Quizizz, Quizlet, Kahoot, and Mentimeter.

Level of the Application of Digital Education Tools

Table 2 shows the level of application of digital education tools in the teaching-learning process, with a grand mean score of 3.98, described as applied. The data revealed that Quizizz received the highest weighted mean of 4.14, followed closely by Word Wall with a mean of 4.10. Meanwhile, Quizlet and Mentimeter recorded weighted means of 3.91 and 3.89, respectively, while Kahoot had the lowest mean of 3.85. Despite the variations in scores, all digital tools are consistently described as applied, indicating their active use in instructional settings.

The results indicate that digital education tools are actively utilized in classrooms. The consistent application of these tools imply that teachers recognize the value in supporting student engagement and interactive learning. Applying digital education tools could maximize their impact on student engagement.

Research supports this idea as Wang and Tahir (2020) mentioned that gamified learning platforms like Quizizz and Kahoot increase student motivation and participation. Similarly, a study by Lu, Schleiger, and Chiu (2018) found that tools such as Quizlet and Mentimeter improve knowledge retention and active recall. Furthermore, Heidenreich and Turcsányi-Szabó (2019) emphasized that digital learning platforms create interactive environments that support diverse learning styles. These findings reinforce the importance of incorporating digital education tools effectively to optimize the teaching-learning experience.

Table 2 Level of application of digital education tools

Application of Digital Education Tools	Weighted Mean	Description
Word Wall	4.10	Applied
Quizizz	4.14	Applied
Quizlet	3.91	Applied
Kahoot	3.85	Applied
Mentimeter	3.89	Applied
Grand Mean	**3.98**	**Applied**

Level	*Range*	*Description*
5	*4.21-5.00*	*Highly Applied*
4	*3.41-4.20*	*Applied*

3	*2.61-3.40*	*Moderately Applied*
2	*1.81-2.60*	*Less Applied*
1	*1.00-1.80*	*Least Applied*

Students' Academic Engagement

The third research problem focused in determining the level of the students' academic engagement in terms cognitive, affective, social, task, and communicative engagements.

Level of Students' Academic Engagement

Table 3 presents the level of students' academic engagement across five dimensions such as cognitive, affective, social, task, and communicative engagement which contributing to a grand mean of 4.46 with a description of highly engaged. The results display that all aspects are rated as highly engaged, with social engagement receiving the highest weighted mean of 4.61, followed by affective engagement with 4.50 and communicative engagement obtained 4.44. Cognitive engagement garnered 4.40 and task engagement with 4.37 also show high levels.

These findings imply that students actively engaged in various aspects of learning, demonstrating strong intellectual, emotional, social, and behavioral involvement in academic activities.

. The findings supported with existing literature on student engagement. Biggs and Tang (2018), academic engagement is a multidimensional construct encompassing behavioral, emotional, and cognitive involvement, all of which contribute to learning success. Similarly, Fisher, Lindgren, and Wright (2020) emphasized that social and affective engagement are critical for fostering a supportive learning environment that enhances student motivation. More recent studies, such as those by Karakas and Kock (2020), further support the idea that highly engaged students demonstrate improved academic performance, stronger social connections, and greater persistence in their studies. These findings reinforce the importance of maintaining student-centered teaching strategies that promote active participation and meaningful learning experiences.

Table 3 Level of students' academic engagement

Students' Academic Engagement	**Weighted Mean**	**Description**
Cognitive	4.40	Highly Engaged
Affective	4.50	Highly Engaged
Social	4.61	Highly Engaged
Task	4.37	Highly Engaged
Communicative	4.44	Highly Engaged
Grand Mean	**4.46**	**Highly Engaged**

Level	*Range*	*Description*
5	*4.21-5.00*	*Highly Engaged*
4	*3.41-4.20*	*Engaged*
3	*2.61-3.40*	*Moderately Engaged*
2	*1.81-2.60*	*Less Engaged*
1	*1.00-1.80*	*Least Engaged*

Relationship of the Teaching-Learning Environment and Students' Academic Engagements

The fourth Research problem focused in finding out significant relationship between teaching learning environments and students' academic engagement.

Student-Centered Learning and Students' Academic Engagement

Table 4 reflects the relationship between teaching-learning environments and students' academic engagement. The correlation matrix shows that student-centered learning had a significant relationship with all the parameters used to measure the students' academic engagement in terms of cognitive academic

engagement (corr. coef.=0.565** with a p-value of 0.001); affective academic engagement (corr. coef.=0.554** with a p-value of 0.001); social academic engagement (corr. coef.=0.766** with a p-value of 0.000); task academic engagement(corr. coef.=0.455* with a p-value of 0.010);and communicative academic engagement (corr. coef.=0.542** with a p-value of 0.002).

The result means that teaching-learning environments like student-centered learning is highly significant to students' academic engagement. The presented probability values which are less than the set 1% level of significance means that the stated hypothesis on this aspect of the study is rejected. This indicates that teachers who create enriched teaching-learning environments, particularly through student-centered learning, are more effective in enhancing students' academic engagement.

The findings imply that when teaching focuses on students' needs, interests, and participation, they are more likely to be actively engaged in their learning because students learn better when they feel involved, valued, and connected to the lesson. A student-centered approach makes learning more relevant and enjoyable, which increases their motivation and engagement.

Research supports this finding, as Reeve and Shin (2017) mentioned that student-centered learning environments, where instruction is tailored to individual student needs and interests, play an important role in fostering engagement. Such environments empower students by allowing them to actively participate in the learning process, making them feel more invested in their education. Furthermore, the autonomy that student-centered learning offers tends to boost intrinsic motivation, leading students to engage more deeply with academic material.

Collaborative Learning and Students' Academic Engagement

As reflected in Table 6, the relationship between teaching-learning environments and students' academic engagement. The correlation matrix shows that collaborative learning had a significant relationship with the parameters used to measure the students' academic engagement in terms of cognitive academic engagement (corr. coef.=0.495** with a p-value of 0.001) and task academic engagement (corr. coef.=0.458** with a p-value of 0.010). No correlation found on affective, social, and communicative academic engagements.

The result means that teaching-learning environments like collaborative learning is highly significant to students' academic engagement. The presented probability values which are less than the set 1% level of significance means that the stated hypothesis on this aspect of the study is rejected. It further means that collaborative learning has a strong and meaningful impact on students' academic engagement. When students work together, they are more likely to participate actively, stay motivated, and develop a deeper understanding of the material.

It implies that collaborative learning is an effective teaching strategy for increasing student engagement. This indicates that encouraging teamwork, discussions, and group activities can lead to better participation, motivation, and deeper understanding among students.

The finding is supported to the statement as Johnson and Johnson (2017) emphasized the importance of collaborative learning environments, which allow students to work together in teams to achieve shared goals. Collaborative settings encourage social interaction and peer support, which increases student accountability and engagement. When students work together, they benefit from diverse perspectives and learn to communicate effectively, both of which enhance their understanding of academic content and keep them actively involved in the learning process.

Real-World Relevance and Students' Academic Engagement

On real -world relevance, the relationship between teaching-learning environments and students' academic engagement. The correlation matrix shows that real-world relevance is highly significant to students' academic engagement in terms of cognitive academic engagement (corr. coef.=0.743** with a p-value of 0.000); affective academic engagement (corr. coef.=0.601** with a p-value of 0.000); social academic engagement (corr. coef.=0.578** with a p-value of 0.001). No correlation showed on task academic engagement and communicative academic engagement.

The result means that teaching-learning environments like real-world relevance is highly significant to students' academic engagement. The presented probability values which are less than the set 1% level of significance means that the stated hypothesis on this aspect of the study is rejected. It further means that incorporating real-world relevance in the teaching-learning environment has a strong and meaningful impact on students' academic engagement.

Based on the findings, it implies that when learning is connected to real-world situations, students are more likely to be engaged in their studies. This indicates that teachers incorporate practical applications, real-life examples, and experiential learning to enhance student engagement and learning outcomes.

The results conform to what Strobel and van Barneveld (2016) highlighted that teaching methods which connect academic material to real-world applications are highly effective in boosting engagement. When students see the relevance of their studies to real-life contexts, they become more motivated to engage with the material. This practical approach to learning allows students to understand the value of their education beyond the classroom, resulting in higher levels of academic commitment and enthusiasm.

Scaffolded Support and Students' Academic Engagement

On cross-communication communication skills, the correlation matrix shows that scaffolded support had a significant relationship with all the parameters used to measure the student' academic engagement in terms of cognitive academic engagement (corr. coef.=0.689** with a p-value of 0.000); affective academic engagement (corr. coef.=0.448** with a p-value of 0.011); social academic engagement (corr. coef.=0.461** with a p-value of 0.009); task

academic engagement (corr. coef.=0.386** with a p-value of 0.032);and communicative academic engagement (corr. coef.=0.378* with a p-value of 0.036).

The result means that teaching-learning environments like scaffolded support is highly significant to students' academic engagement. The presented probability values which are less than the set 1% level of significance means that the stated hypothesis on this aspect of the study is rejected. It further means that providing scaffolded support helps students stay actively engaged in their learning. When teachers offer appropriate support based on students' needs, it enhances their confidence, motivation, and ability to tackle complex tasks, leading to improved academic engagement and performance.

This implies that scaffolded support from teachers play an important role in keeping students engaged in learning. Scaffolded support improves independence, deeper understanding, and sustained academic involvement. This indicates that teachers implement tailored instructional strategies to enhance student engagement and learning outcomes.

Based on the findings, the result is supported to the study of Van de Pol, Volman, and Beishuizen (2019) argued that scaffolded support from instructors plays an essential role in student engagement. Scaffolding, or providing structured support that gradually decreases as students become more competent, allows learners to feel challenged yet supported. This balance helps students build confidence in tackling academic tasks, fostering engagement as they move toward independent mastery of new skills and concepts.

Table 4 Correlation matrix showing the relationship of the **teachers' teaching-learning environment and students' academic engagement.**

Spearman Rho						
Teaching-Learning Environment		**Cognitive**	**Affective**	**Social**	**Task**	**Communicative**
Student-centered	Cor. Coef.	**0.565****	**0.554****	**0.766****	**0.455***	**0.542****
Learning	Probability	0.001	0.001	0.000	0.010	0.002
Collaborative	Cor. Coef.	**0.495****	0.196	0.242	**0.458****	0.164
Learning	Probability	0.005	0.291	0.189	0.010	0.379
Real-world	Cor. Coef.	**0.743****	**0.601****	**0.578****	0.292	0.340
Relevance	Probability	0.000	0.000	0.001	0.111	0.061
	Cor. Coef.	**0.689****	**0.448***	**0.461****	**0.386***	**0.378***
Scaffolded support	Probability	0.000	0.011	0.009	0.032	0.036

**.Correlation is significant at the 0.01 level.

*.Correlation is significant at the 0.05 level.

Influence of the Teaching-Learning Environment on the Students' Academic Engagements

The fifth research problem focused in finding out the significant influence of teaching-learning environments significantly influence on the students' academic engagement.

Teaching-Learning Environments on Cognitive Engagement

Table 5 shows the combined effect of the teaching-learning environment significantly influenced to students' academic engagement in terms of cognitive engagement (F-value = 12.038, Probability = 0.000). The stated hypothesis of the study was rejected because the probability value is significantly lesser than 0.050 level of significance.

In fact, 64.90% of the variation of students' academic engagement in terms of cognitive engagement was accounted by student-centered learning. The remaining 35.10% was accounted by some engagements not involved in the study.

Among the academic engagement involved in the study, student-centered learning was found to be the significant predictor on students' academic engagement. This implies that student-centered learning strongly influences how engaged students are in their studies. Since it is a key factor, it further implies that teaching approaches that prioritize students' needs, interests, and active participation are highly effective in keeping them engaged. Teachers may need to emphasize student-centered strategies to enhance learning outcomes.

Research supports this idea, as Schunk (2017) mentioned that student-centered learning (SCL) has gained significant attention in modern education due to its ability to foster deeper cognitive engagement among students. Unlike traditional teacher-centered approaches, which emphasize passive learning, SCL shifts the focus to active participation, critical thinking, and problem-solving. This pedagogical shift has been shown to enhance students' cognitive engagement by promoting autonomy, motivation, and deeper learning experiences.

Teaching-Learning Environment on Affective Engagement

As reflected in Table 5, the combined effect of the teaching-learning environment is significantly influenced to students' academic engagement in terms of affective engagement (F-value = 11.571, Probability = 0.000). The stated hypothesis of the study was rejected because the probability value is significantly lesser than 0.050 level of significance.

In fact, 64.00% of the variation of students' academic engagement in terms of affective engagement was accounted by student-centered learning and real-world relevance. The remaining 36.00% was accounted by some engagements not involved in the study.

Among the academic engagement involved in the study, student-centered learning and real-world relevance were found to be the significant predictor on students' academic engagement. This implies that student-centered learning and real-world relevance are key factors in keeping students engaged in their studies. When lessons focus on students' needs and interests and connect to real-life situations, students are more motivated and involved. This further implies that teachers prioritize these approaches to enhance academic engagement and improve learning outcomes.

The finding is concomitant to what Ross (2018) explained the combination of student-centered learning and real-world relevance significantly enhances affective engagement by fostering intrinsic motivation, emotional investment, and a sense of purpose. By creating meaningful and personalized learning experiences, educators can cultivate students' enthusiasm, resilience, and long-term commitment to learning.

Teaching-Learning Environment on Social Engagement

As gleaned in Table 5, the combined effect of the teaching-learning environment is highly influenced to students' academic engagement in terms of social engagement (F-value = 7.510, Probability = 0.000). The stated hypothesis of the study was rejected because the probability value is significantly lesser than 0.010 level of significance.

In fact, 53.60% of the variation of students' academic engagement in terms of social engagement was accounted by student-centered learning. The remaining 46.40% was accounted by some engagements not involved in the study.

Among the academic engagement involved in the study, student-centered learning was found to be the best predictor on students' academic engagement. This implies that student-centered learning had the strongest influence on students' academic engagement. It further implies that teaching methods that focus on students' needs, interests, and active participation are the most effective in keeping them engaged. Teachers prioritize student-centered approaches to enhance learning outcomes.

Research supports this finding, as Niemann and Hoffer (2020) highlighted that student-centered learning significantly enhances social engagement by encouraging collaboration, fostering inclusive participation, and developing essential interpersonal skills. By creating a learning environment that values interaction and cooperation, SCL helps students build strong social connections and become more engaged members of their academic and social communities.

Teaching-Learning Environment on Task Engagement

As revealed in Table 5, the combined effect of the teaching-learning environment is significantly influenced to students' academic engagement in terms of task engagement (F-value = 3.267, Probability = 0.027). The stated hypothesis of the study was rejected because the probability value is significantly lesser than 0.050 level of significance.

In fact, 33.40% of the variation of students' academic engagement in terms of task engagement was accounted by collaborative learning. The remaining 66.60% was accounted by some engagements not involved in the study.

Among the academic engagement involved in the study, collaborative learning was found to be the significant predictor on students' academic engagement. This implies that collaborative learning plays an important role in keeping students engaged in their studies. It further implies that when students work together, share ideas, and participate in group activities, they are more likely to stay motivated and actively involved in learning. In this case, teacher incorporate more collaborative learning strategies to enhance student engagement and improve learning outcomes.

The results support this finding, as Morrison (2020) emphasized collaborative learning significantly enhances task engagement by promoting accountability, fostering interactive learning experiences, and providing peer support. By working together toward common goals, students develop a deeper commitment to their tasks, leading to greater motivation, perseverance, and overall academic success.

Teaching-Learning Environment on Communicative Engagement

On communicative engagement, the combined effect of the teaching-learning environment had no significant influenced to student' academic engagement in terms of communicative engagement (F-value =2.164, Probability = 0.010ns). The stated hypothesis of the study was accepted since the probability value is higher than 0.050 level of significance.

This implies that all dimensions of teaching-learning environments under study were not contributed to students' academic engagement. This means that none of the teaching-learning environment factors examined in the study had a significant impact on students' academic engagement. In other words, these factors did not directly influence how engaged students were in their learning. Yet, other elements, not included in the study, may play a more important role in student engagement.

Based on the results, the findings negate to the study of Luo, Koller, and Rosenberg (2020) found that student-centered learning collaboration, real-world relevance, and scaffolded support collectively enhance students' academic engagement by promoting motivation, interaction, meaningful learning, and

structured guidance. By integrating these approaches, educators can create an enriching learning environment that fosters deep, sustained engagement and academic success.

Table 5 Summary of the influence of teaching-learning environments on students' academic engagements.

Teaching-Learning Environments	Cognitive t-value	Affective t-value	Social t-value	Task t-value	Communicative t-value
(Constant)	**1.868**	**0.066**	**0.418**	**0.364**	**0.703**
Student Centered	**2.116***	**2.295***	**2.996****	**1.441**	**1.446**
Collaborative	**1.245**	**1.068**	**0.702**	**2.338***	**0.291**
Real World Relevance	**1.436**	**2.758****	**0.722**	**1.327**	**0.030**
Scaffolded Support	**0.685**	**0.681**	**0.121**	**0.989**	**0.660**
	$R^2 = 0.649$	$R^2 = 0.640$	$R^2 = 0.536$	$R^2 = 0.334$	$R^{2=}0.248$
	Prob.= 0.000	*Prob. = 0.000*	*Prob.= 0.000*	*Prob.= 0.027*	$Prob=0.104^{ns}$
	F – Value = 12.038	*F–Value=11.571*	*F-Value =7.510*	*F-Value =3.267*	*F-Value=2.164*

Relationship of the Application of Digital Education Tools and Students' Academic Engagements

The sixth research problem focused in finding out the significant relationship between the application of digital education tools and students' academic engagement.

Word Wall and Students' Academic Engagement

Table 6 highlights the relationship between application of digital education tools and students' academic engagement. The correlation matrix shows that word wall education tool had significant relationship with the parameters used to measure the students' academic engagement in terms of cognitive academic engagement (corr. coef.=0.568** with a p-value of 0.001); social academic engagement (corr. coef.=0.632** with a p-value of 0.000); task academic engagement(corr. coef.=0.437* with a p-value of 0.014);and communicative academic engagement (corr. coef.=0.507** with a p-value of 0.004). No correlation found on affective academic engagement.

The result means that application of digital education tool like word wall is highly significant to students' academic engagement. The presented probability values which are less than the set 1% level of significance means that the stated hypothesis on this aspect of the study is rejected. This further means that the Word wall digital education tool has a strong and meaningful impact on students' academic engagement because Word wall provides interactive and engaging learning activities that make lessons more enjoyable and participatory that capture students' interest, encourage active learning, and enhance motivation, leading to higher academic engagement.

Based on the findings, it implies that integrating the Wordwall digital education tool into teaching can significantly enhance students' academic engagement. Its interactive and gamified activities make learning more enjoyable and participatory, helping to maintain students' interest, boost motivation, and promote active involvement in lessons.

As Chai, Koh, and Tsai (2019) cited Word walls are powerful tools that significantly enhance students' academic engagement through interactive learning. Word walls serve as visual anchors in the classroom, reinforcing vocabulary and key concepts that facilitate learning retention. By displaying essential terms and phrases prominently, students can easily refer to them during lessons and activities, promoting active participation and self-directed learning.

Quizizz and Students' Academic Engagement

On quizizz, the relationship between application of digital education tools and students' academic engagement. The correlation matrix shows that quizizz education tool had significant relationship with the parameters used to measure the students' academic engagement in terms of cognitive academic engagement (corr. coef.=0.445* with a p-value of 0.012); affective academic engagement (corr. coef.=0.461* with a p-value of 0.009); social academic engagement(corr. coef.=0.496** with a p-value of 0.005);and communicative academic engagement (corr. coef.=0.523** with a p-value of 0.003). No correlation found on task academic engagement.

The result means that application of digital education tool like quizizz is highly significant to students' academic engagement. The presented probability values which are less than the set 1% level of significance means that the stated hypothesis on this aspect of the study is rejected. This further means that the Quizizz digital education tool has a strong and positive impact on students' academic engagement. It further means that using Quizizz helps make learning more interactive, enjoyable, and motivating, which keeps students actively involved in their studies.

Based on the findings, it implies that incorporating Quizizz into teaching can effectively enhance students' academic engagement. Its interactive and gamified features make learning more engaging and enjoyable, encouraging active participation and motivation since Quizizz uses game-based learning, instant feedback, and interactive quizzes that make lessons fun and engaging. These features capture students' attention, encourage competition, and provide a sense of achievement, which helps boost motivation and keeps them actively involved in their studies.

The findings agree to what Martin, Budhrani, and Wang (2020) discussed in Quizizz sessions, students become more actively involved in their learning, which contributes to better retention and understanding of course material. Additionally, the customizable nature of Quizizz allows teachers to tailor quizzes to suit their curriculum, providing immediate insights into student performance and helping to identify areas that may require further instruction or reinforcement. These interactive elements foster a sense of excitement and anticipation in the classroom, keeping students engaged and invested in their educational journey.

Quizlet and Students' Academic Engagement

On Quizlet, the relationship between application of digital education tools and students' academic engagement. The correlation matrix shows that quizlet education tool had significant relationship with all the parameters used to measure the students' academic engagement in terms of cognitive academic engagement (corr. coef.=0.404* with a p-value of 0.024); affective academic engagement (corr. coef.=0.370* with a p-value of 0.041); social academic engagement (corr. coef.=0.516** with a p-value of 0.003); task academic engagement (corr. coef.=0.431* with a p-value of 0.015); and communicative academic engagement (corr. coef.=0.612** with a p-value of 0.000).

The result means that application of digital education tool like Quizlet is significant to students' academic engagement. The presented probability values which are less than the set 5% level of significance means that the stated hypothesis on this aspect of the study is rejected. This further means that using Quizlet has a strong and meaningful impact on students' academic engagement. It indicates that Quizlet helps students stay actively involved in learning by making study sessions more interactive, accessible, and engaging.

This implies that integrating Quizlet into teaching can effectively enhance students' academic engagement. Its interactive features, such as flashcards, quizzes, and games, make learning more enjoyable and accessible, encouraging active participation and motivation due to fact that Quizlet provides interactive and flexible learning tools that cater to different learning styles. Its instant feedback, self-paced study options, and gamification elements make learning more engaging, motivating, and accessible, which helps students stay actively involved in their studies.

As highlighted by Bayeck (2018), Quizlet enhances student engagement by gamifying the study experience through flashcards, quizzes, and games. By turning review sessions into interactive activities, Quizlet helps sustain student interest and motivation, making the learning process more enjoyable. The app's ability to provide instant feedback allows students to track their progress, which can foster a sense of accomplishment and encourage continued engagement with the material.

Kahoot and Students' Academic Engagement

On Kahoot, the relationship between application of digital education tools and students' academic engagement. The correlation matrix shows that Kahoot education tool had significant relationship with all the parameters used to measure the students' academic engagement in terms of cognitive academic engagement (corr. coef.=0.420* with a p-value of 0.019); affective academic engagement (corr. coef.=0.389* with a p-value of 0.031); social academic engagement (corr. coef.=0.466** with a p-value of 0.008); task academic engagement (corr. coef.=0.566** with a p-value of 0.001); and communicative academic engagement (corr. coef.=0.360* with a p-value of 0.047).

The result means that application of digital education tool like Kahoot is significant to students' academic engagement. The presented probability values which are less than the set 5% level of significance means that the stated hypothesis on this aspect of the study is rejected. This further means that the Kahoot education tool has a strong and positive impact on students' academic engagement. It indicates that using Kahoot makes learning more interactive, enjoyable, and motivating, which helps students stay actively involved in their studies.

This implies that incorporating Kahoot into teaching can effectively enhance students' academic engagement. Its game-based learning approach, interactive quizzes, and real-time feedback create a fun and competitive learning environment, increasing student participation, motivation, and retention.

As mentioned by Plump and LaRosa (2017) mentioned that Kahoot serves as an effective digital education tool that significantly boosts students' academic engagement by incorporating gamification, promoting cognitive involvement, and fostering social interaction. Its interactive and student-centered approach makes learning more engaging, enjoyable, and effective, ultimately contributing to better academic outcomes.

Mentimeter and Students' Academic Engagement

On Mentimeter, the relationship between application of digital education tools and students' academic engagement. The correlation matrix shows that Mentimeter education tool had significant relationship with the parameters used to measure the students' academic engagement in terms of cognitive academic engagement (corr. coef.=0.418* with a p-value of 0.019); affective academic engagement (r=0.430* with a p-value of 0.016); social academic engagement (corr. coef.=0.533** with a p-value of 0.001); task academic engagement (corr. coef.=0.505** with a p-value of 0.004). No correlation showed on communicative academic engagement.

The result means that application of digital education tool like Mentimeter is significant to students' academic engagement. The presented probability values which are less than the set 5% level of significance means that the stated hypothesis on this aspect of the study is rejected. This further means that

Mentimeter digital tool had a strong and positive impact on students' academic engagement. It indicates that using Mentimeter makes learning more interactive, participatory, and engaging, helping students stay actively involved in lessons.

Based on the results, this implies that incorporating Mentimeter into teaching can effectively enhance students' academic engagement. Its interactive features, such as live polls, quizzes, and word clouds, encourage active participation, making lessons more dynamic and engaging.

As argued by Wang and Lieberoth (2016), gamified learning tools such as Mentimeter is particularly effective at boosting student engagement through competition and instant feedback. Mentimeter's live polling increase classroom participation and make learning enjoyable. This tool allows students to answer questions in real time and see immediate results, which not only enhances motivation but also helps sustain attention, leading to better overall academic engagement.

Table 6 Correlation matrix showing the relationship of **the application of digital education tools and students' academic engagement.**

Spearman Rho						
Digital Tools Application		**Cognitive**	**Affective**	**Social**	**Task**	**Communicative**
	Cor. Coef.	**0.568****	0.351	**0.632****	**0.437***	**0.507****
World wall	Probability	0.001	0.053	0.000	0.014	0.004
	Cor. Coef.	**0.445***	**0.461****	**0.496****	0.269	**0.523****
Quizizz	Probability	0.012	0.009	0.005	0.143	0.003
	Cor. Coef.	**0.404***	**0.370***	**0.516****	**0.431***	**0.612****
Quizlet	Probability	0.024	0.041	0.003	0.015	0.000
	Cor. Coef.	**0.420***	**0.389***	**0.466****	**0.566****	**0.360***
Kahoot	Probability	0.019	0.031	0.008	0.001	0.047
	Cor. Coef.	**0.418***	**0.430***	**0.553****	**0.505****	0.336
Mentimeter	Probability	0.019	0.016	0.001	0.004	0.065

**.Correlation is significant at the 0.01 level.

*.Correlation is significant at the 0.05 level.

Influence of the Application of Digital Education Tools on the Students' Academic Engagements

The seventh research problem focused in finding out the significant influence of digital education tools on the students' academic engagement.

Digital Education Tools on Cognitive Academic Engagement

Table 7 displays the combined effect of the digital education tools had no significant influenced to student' academic engagement in terms of cognitive academic engagement (F-value =2.800, Probability = 0.038ns). The stated hypothesis of the study was accepted since the probability value is higher than 0.050 level of significance.

This implies that using digital education tools does not significantly impact students' cognitive academic engagement. This may be because these tools focus more on interaction, motivation, and participation rather than deep cognitive processing. It indicates that while digital tools enhance engagement in terms of enjoyment and activity, they may not directly improve critical thinking, problem-solving, or deep learning unless paired with strategies that promote higher order thinking skills.

The results conform to what Azhar, and Iqbal (2017) mentioned that Word wall significantly influences students' social and academic engagement by fostering collaboration, enhancing motivation, and making learning interactive. By incorporating digital tools like Word Wall, teacher can create an engaging learning environment that promotes both knowledge retention and meaningful social interactions among students.

Digital Education Tools on Affective Academic Engagement

As reflected in Table 7, the combined effect of the digital education tools had no significant influenced to student' academic engagement in terms of affective academic engagement (F-value =2.656, Probability = 0.047ns). The stated hypothesis of the study was accepted since the probability value is higher than 0.050 level of significance.

This implies that using digital education tools does not significantly influence students' emotional connection to learning, such as their interest, enjoyment, or sense of belonging. This may be because digital tools focus more on interaction and participation rather than fostering deep emotional engagement. It

indicates that while these tools enhance motivation and activity, they may not directly impact students' feelings toward learning unless combined with supportive teaching strategies that nurture emotional connections and personal relevance.

Based on the findings, the results of the study negate to study of Lowenthal et al (2020) found that that digital education tools significantly enhance students' affective academic engagement by increasing motivation, fostering autonomy, and promoting social interaction. By making learning more enjoyable, interactive, and personalized, these tools help create a positive emotional connection to academic experiences, ultimately leading to improved learning outcomes.

Digital Education Tools on Social Academic Engagement

On social academic engagement, the combined effect of the digital education tools significantly influenced to students' academic engagement in terms of social engagement (F-value = 4.597, Probability = 0.004). The stated hypothesis of the study was rejected because the probability value is significantly lesser than 0.050 level of significance.

In fact, 47.90% of the variation of digital education tools in terms of Word Wall was accounted by social academic engagement. The remaining 35.10% was accounted by some digital education tools not involved in the study.

Among the digital education tools involved in the study, Word Wall was found to be the significant predictor on students' academic engagement. This implies that student-centered learning strongly influences how engaged students are in their studies. This means that the Word Wall digital education tool has a strong and positive impact on students' academic engagement. It indicates that using Word Wall makes learning more interactive, engaging, and enjoyable, which helps students stay actively involved in their studies.

This implies that integrating Word Wall into teaching can effectively enhance students' academic engagement. Its interactive and gamified learning activities capture students' interest, encourage active participation, and make lessons more enjoyable. This means that teachers consider using Wordwall to create dynamic and engaging learning experiences that keep students motivated and involved.

The results conform to what Dizon (2016) found that digital education tools significantly enhance students' social academic engagement by fostering collaboration, communication, and interactive participation. By creating opportunities for teamwork, peer interaction, and shared learning experiences, these tools help students build stronger social connections and become more actively engaged in their academic pursuits.

Digital Education Tools on Task Academic Engagement

On task academic engagement, the combined effect of the digital education tools had no significant influenced to student' academic engagement in terms of task academic engagement (F-value =2.912, Probability = 0.033ns). The stated hypothesis of the study was accepted since the probability value is higher than 0.050 level of significance.

This implies that digital education tools do not significantly impact students' task academic engagement, meaning they do not directly enhance students' focus, effort, or persistence in completing academic tasks. This may be because these tools are often used for interactive and gamified learning rather than for promoting sustained concentration and task commitment. It indicates that while digital tools can make learning enjoyable, they may not necessarily improve students' ability to stay focused on academic tasks unless integrated with structured learning strategies that encourage discipline and persistence.

The finding of the study is supported to what Wang and Tahir (2020) found that digital education tools may not always enhance students' task academic engagement due to potential distractions, lack of accountability, and limited adaptability. While they offer interactive learning experiences, they should be carefully integrated with structured guidance and teacher support to ensure students remain focused, persistent, and actively engaged in completing academic tasks.

Digital Education Tools on Communicative Academic Engagement

On communicative academic engagement, the combined effect of the digital education tools had no significant influenced to student' academic engagement in terms of communicative academic engagement (F-value =1.986, Probability = 0.116ns). The stated hypothesis of the study was accepted since the probability value is higher than 0.050 level of significance.

Based on the results, this implies that digital education tools do not significantly enhance students' communicative academic engagement, meaning they do not directly improve students' interactions, discussions, or collaborative learning experiences. This may be because many digital tools focus on individual learning, quizzes, or gamification rather than fostering meaningful dialogue and collaboration. It indicates that while digital tools can engage students in activities, they may not necessarily promote deeper communication skills unless paired with structured discussions, group activities, or teacher-guided interactions.

The results conform as mentioned by Kozlowski and Ilgen (2019), digital education tools provide communication channels, they may not always enhance students' communicative academic engagement due to limited real-time interaction, passive participation, and technical barriers. To foster meaningful communication, digital tools should be supplemented with structured facilitation, interactive discussions, and strategies that encourage active verbal engagement.

Table 7 Summary of the Influence of **application of digital education tools on students' academic engagements.**

Application of Digital Education Tools	Cognitive **t-value**	Affective **t-value**	Social **t-value**	Task **t-value**	Communicative **t-value**
(Constant)	5.444	4.660	8.421	6.448	5.266
Word Wall	1.205	0.116	**2.103***	0.429	0.175
Quizizz	0.129	0.729	0.108	1.910	0.670
Quizlet	0.036	0.292	0.560	0.476	1.337
Kahoot	0.339	0.104	0.902	1.621	0.749
Mentimeter	0.770	1.629	1.685	0.894	0.144

R^2 = 0.359	*R^2 = 0.347*	*R^2 = 0.479*	*R^2 = 0.368*	*$R^{2=}$0.284*
Prob.= 0.038	*Prob. = 0.047*	*Prob.= 0.004*	*Prob.= 0.033*	*Prob=0.116^{ns}*
F – Value = 2.800	*F-Value=2.656*	*F-Value =4.597*	*F-Value =2.912*	*F-Value=1.986*

Conclusion

Based on the findings of the study, the following conclusions were drawn:

1. Teachers actively implement various teaching-learning strategies to enhance student engagement. Student-centered learning, collaborative learning, real-world relevance, and scaffolded support were all highly practiced, demonstrating a commitment to fostering an interactive and supportive educational environment.
2. The highly applied of digital education tools, including WordWall, Quizizz, Quizlet, Kahoot, and Mentimeter, plays an important role in enhancing students' academic engagement.
3. Students exhibited a high level of engagement across cognitive, affective, social, task-related, and communicative dimensions that effectively foster active participation and meaningful learning experiences.
4. There was a significant relationship between teaching-learning environments and students' academic engagement, indicating that the nature of the instructional setting directly affects students' level of involvement and participation in their learning process.
5. Teaching-learning environments significantly contribute to students' academic engagement, playing in shaping students' involvement and active participation in the class.
6. Digital education tools and students’ academic engagements were significantly related.
7. Only WordWall made a significant contribution to students' task engagement.

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The researcher was born in M'lang, Cotabato on May 1, 1995, under the zodiac sign of Taurus. He possesses the qualities of desire, confidence, and perseverance. He is the oldest son from the two children of Mr. and Mrs. Giovannie B. Barrios. He completed his elementary education at Malayan Elementary School, his secondary education at Mlang National High School and his tertiary education at Southern Baptist College.

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He obtained a Master of Arts in Education with a concentration in Educational Administration (MAED) from Cotabato Foundation College of Science and Technology (CFCST). The researcher is committed to his professional growth, which led him to enrol in the same institution, Cotabato Foundation College of Science and Technology (CFCST), to pursue a Doctor of Education (EdD) with a major in Educational Management.

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