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The impact of digital teaching materials on educational engagement and outcomes in science education: The mediating role of technology integration an empirical analysis of private universities in Jordan

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A B S T R A C T

This study aims to evaluate an intervention that moved beyond the dimensions of digital information application (DTMs) in science education in higher education. Using an integrated methodology, there is a large and growing body of evidence for the prominence placed on both perceived experience and quality tutors in science courses in educating institutions with broader ambivalence toward limited Digital Literacy. The model and Hypotheses were tested with data collected from 158 participants. Our results suggest that user perceptions about the value of DTM may be contingent on several factors beyond any intrinsic greater experience in learning and teaching Science. The quality of tutors may lead to a greater perceived usefulness regarding the technology. Also, the level of communication flow can affect how much science students are willing to use technology. Academic institutions will have to reassess the utility of digital information technology as an instrument for improving science education. This research focused on educational contexts where DTM profoundly influences teaching and learning science. Further research could focus on other educational fields, math, or language to broaden the understanding of technology's role in diverse educational contexts.

1. Introduction

Today's world is filled with lightning-quick, technology-powered classrooms, and the need to utilize digital teaching materials in education finds a more significant purpose every day (Deng et al., 2020). The integration of these materials in science education is particularly significant, given the complex and dynamic nature of scientific concepts that often require interactive and visual learning approaches (Juhji & Nuangchalerm, 2020; Darmaji et al., 2022). The impact of these materials on educational engagement and outcomes, particularly within private universities in Jordan, would greatly benefit existing literature. Thus, this study will investigate how technology integration mediates the effectiveness of digital teaching resources regarding student learning experiences and academic performance in science education (Bani Ahmad et al., 2024). In science education, Digital teaching materials like e-books, online courses, virtual labs, simulations, interactive modules, and interactive platforms offer many benefits. They allow access to scientific resources in an extremely flexible way, adapt to changing requirements, and offer highly interactive learning environments that can cater to a wide range of types and preferences of learners (Alenezi, 2020). This empowers students to learn at their own pace while utilizing these materials to facilitate understanding of intricate scientific phenomena and cater to diverse learning preferences (Harahap et al., 2019). Digital teaching aids are considered an investment to drive higher educational engagement and outcomes. Digital capabilities can be effectively employed in instruction is contingent upon, among other things, the appropriate embedding of technology within the educational setting (Bond et al., 2020). By allowing students to experiment, visualize, and interact with content, these materials support active learning and critical thinking, essential components of scientific inquiry (Liew et al., 2019). Successful technology integration depends on technical skills, but even more on knowing how to apply these tools to a curriculum (Tiwari et al., 2024).

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The Technology Acceptance Model (TAM) provides a model for studying the adoption and utilization of digital teaching materials. TAM posits that perceived ease of use and perceived usefulness are two critical predictors of accepting new technology. On the other hand, perceived usefulness encompasses end-users' beliefs about how effectively they think by utilizing an information technology system and their work performance (Moyano-Fuentes et al., 2021). Digital teaching materials are perceived as easy to use, and certain aspects can dictate this ease. Perceived ease of use and, in the case that it is both easy to use and useful at the same time, perceived usefulness can be determined by digital content relevance quality as well as how digital tools support learning outcomes (Cabero-Almenara et al., 2022). In science education, perceived usefulness is linked to how well digital tools facilitate understanding complex scientific concepts and improve students' thinking skills with practical application of scientific knowledge. Similarly, perceived ease of use depends on the relevance and quality of digital content, as well as the ability of these tools to support learning outcomes (Al-Awidi et al., 2024). Teaching quality is another key factor that impacts the overall perceived utility of digital learning material in science education. Enlightening tutors who are experts in wielding digital tools and seamlessly integrating them into the learning process will positively impact students' attitudes toward these tools. To fill this gap, the current research investigates digital learning in higher education in science education from an instructor's perspective at private universities based in Jordan (Tarifa-Rodriguez et al., 2024). Additionally, this study investigates the relationship between tutor quality and the perceived usefulness of digital teaching material, as well as the impact perceived ease of use by students has on the intention to use Digital Teaching Materials in science education. The model and hypotheses were assessed using data collected through a survey of 158 participants. The value of digital teaching material is constructed based on multiple extrinsic affordances to enrich learning and teaching science experiences. The degree of technological readiness significantly influences perceived ease of use, and quality tutoring may enhance perceptions about usefulness (Shqair & Altarazi, 2022). The study's insights contribute to the ongoing discourse on digital learning in science education and offer practical implications for enhancing science teaching and learning practices in higher education. Other factors, such as the flow of information, also affect the intention to adopt technology. As such, academic establishments must reconsider what part digital teaching materials could play in improving student engagement and success (Choi et al., 2024).

In this sense, our study was elaborated in educational environments where the use of digital teaching materials plays an essential role in both the teaching and learning processes in science education. It enriches discussions from future studies and offers practical implications for cases applying to higher education.

2. Literature Review

2.1 Digital Teaching Materials in Science Education

The domain of higher education has been experiencing significant change regarding offering teaching-learning resources through digital teaching materials (DTMs) for versatility, product accessibility, and the rich learning experience that they deliver (Hasanah et al., 2022). DTMs in science education encompass a range of tools such as interactive simulations, virtual labs, educational videos, and e-textbooks. They allow students to engage with scientific concepts dynamically, addressing various learning styles and enabling hands-on experiences that are critical in science education (Al-Awidi et al., 2024).

2.2 Assessment of Digital Teaching Materials in Science

Universities that use Digital material must be evaluated for their impact on teaching outcomes. Numerous design frameworks have been proposed to perform DTMs, usability, engagement, and learning outcomes (Akram et al., 2021). The Technology Acceptance Model (TAM) is the most frequently used model, which was developed to measure perceived ease of use and other salient elements related to an adoption decision (Temilade Abass et al., 2024). The Quality standards offer a seven-point scale for applying quality instructional design and course delivery in online or blended courses through alignment, learner support, and accessibility (Zutiasari, 2021). Quality standards in science education emphasize the need for DTMs to support practical scientific inquiry and experimentation, aligning with curricular goals and providing robust learner support (Harahap et al., 2019). The impact of DTMs on student learning and engagement is multifaceted, so assessment tools/methods should be robust and broad to cover it all.

2.3 Content Quality in Science Education

Content quality is one dimension in designing digital teaching materials that directly affect engagement and learning processes in science education (Juhji & Nuangchalerm, 2020; Tang et al., 2024). The content is informative and contextualized to the curriculum. Hence, it uses multimedia to cater to different learning styles (Kuutila et al., 2024). DTMs in science education incorporate effective elements such as virtual experiments and simulations, which cater to diverse learning needs and enhance student science processing skills to understand complex scientific phenomena (Al-Awidi et al., 2024). Actual quality contains three significant elements: source credibility, presentation clarity, and instructional soundness. Key takeaways include how students use and derive value from high-quality digital materials that enhance the online experience. Several behaviors point to student adoption of quality content (Kuutila et al., 2024).

2.4 Educational Engagement in Science

Educational engagement is a concept that pertains to the level of attention, interest, and curiosity students show when they are learning science (Butler et al., 2024; Harahap et al., 2019). DTM can tremendously boost education engagement by providing powerful, interactive learning experiences such as scientific simulations, problem-solving exercises, and collaborative platforms to foster active learning and deeper engagement with scientific materials that instigate active participation from students collectively, leading to a better understanding of complex concepts (Maulina & Yustika, 2022; Darmaji et al., 2022) In addition, personalized learning paths and adaptive technologies in science education adapt the educational pathway to each student's needs, increasing motivation and engagement (Li et al., 2024; Qian et al., 2023).

2.6 Reliability of Digital Teaching Materials in Science

The reliability of digital teaching materials is significant in how useful they are to your students. This includes the reliability of materials that grant a stable and continuous learning experience (Sekaran & Bougie, 2016). Technical issues such as software bugs, internet failures, and platform downtimes may hinder learning, resulting in less engagement and poor learner outcomes (Indah Nurcahyani & Budi Prabowo, 2024). so, Technical stability, such as consistent performance of virtual labs and simulations, is essential for preventing disruptions in learning (Al-Awidi et al., 2024). The best DTMs are backed by solid technical infrastructure, regularly updated, and have an all-encompassing support system for users. This is a significant step, to keep faith in trust and engagement from students. Reliable DTMs ensure that scientific experiments and educational activities proceed without technical issues, thereby enhancing student engagement and learning outcomes.

2.7 Technology Integration in Science Education

Technology integration means effective integration maximizes the teaching and learning experience using digital technologies while allowing our teachers to do what they are best at teaching, what extent are digital tools available, and whether teachers are prepared and skilled (Lai et al., 2020). which means that incorporating DTMs into teaching science practices will enhance the learning experience (Qian et al., 2023) The Technology Acceptance Model (TAM) theorizes that perceived ease of use and perceived usefulness are vital factors implicated in the successful application of technology when working towards a goal (Venkatesh & Bala, 2008). Research suggests that technology can significantly enhance educational engagement and outcomes and facilitate comprehensive scientific exploration when appropriately implemented (Tkacová et al., 2022).

3. Hypothesis Development

Theoretical and Hypotheses Development Based on the preceding literature discussion, this section proposes a set of hypotheses in line with the suggested title: “The Impact of Digital Teaching Materials on Educational Engagement and Outcomes in Science Education: The Mediating Role of Technology Integration - An Empirical Analysis of Private Universities in Jordan”. This research aims to reveal the mediation role of technology integration in digital teaching materials and educational outcomes for Jordanian private universities.

3.1 Assessment and Educational Engagement in Science

Given the assessment-driven nature of digital teaching materials, this is particularly applicable to understanding their impact on educational engagement in scientific contexts. Additional evaluation frameworks involve assessments of usability, engagement, and learning outcomes correlated to students interacting with the digital teaching materials QM specifically (Kotorov et al., 2024). Interactive assessments with formative feedback could significantly increase the students' interaction, understanding, and participation in learning, therefore, we hypothesize that:

H_1: *Assessment positively influences educational engagement among science students in private universities in Jordan.*

3.2 Assessment and Technology Integration in Science

Assessment plays a crucial part in technology integration as well. The usability and effectiveness of digital teaching tools should be systematically investigated so that educators can pinpoint strengths as well as areas needing attention, which takes the stride towards integrating these technologies into our science curricula. Assessment outcomes can be used to inform the choice and configuration of digital tools that are compatible with science educational aims (Torlak et al., 2022) These hypotheses are intended to examine the double effect of assessment on promoting educational engagement and facilitating technology integration, to more fully understand the impact that digital teaching materials have brought about in higher education, Consequently, we hypothesize that:

H_2: *Assessment positively influences technology integration among science students in private universities in Jordan.*

3.3 Content Quality and Educational Engagement in Science

The academic and emotional capacity of the content in digital teaching materials is a defining factor that influences educational engagement. Furthermore, high-quality content aligned with the formal curriculum and accurate and relevant study material combined with full engagement in online activities enhance student motivation toward learning science (Viere et al., 2021). Increased educational engagement Because good digital teaching materials are abundant in high-quality content, they can be engaging to students and help them grasp concepts more deeply. Therefore, we hypothesize that:

H_3: *Content quality positively influences educational engagement among science students in private universities in Jordan.*

3.4 Content Quality and Technology Integration in Science

Effective teaching technology integration in scientific educational realms requires combining top-notch content incorporated within digital formats. High-quality digital tools, in turn, can guarantee that the content is academically appropriate and process standards-aligned (Pham et al., 2020). Allows digital teaching materials to be easily integrated into science curricula, thereby increasing their usability (Wang et al., 2023). Consequently, we hypothesize that:

H_4: *Content quality positively influences technology integration in science education among students in private universities in Jordan.*

The proposed hypotheses are expected to enrich our theoretical knowledge of the relationship between content quality, educational engagement, and technology integration and provide recommendations to enhance digital teaching material production toward better academic science learning outcomes at private universities within Jordan.

3.5 Reliability and Educational Engagement in Science

Digital teaching materials should be reliable, especially if the university wants students to keep coming back. Digital teaching materials s must be reliable regarding technical stability, and the students find this resource of consistent performance, which has a robust support system to prevent them from approaching other issues while using that specific digital content (Sinsel et al., 2020). As long as students believe that the digital tools they are using will work and continue to function without any hitches, they can then get more engaged with what is happening in their scientific environment. This continuous involvement plays a key role in improving the quality of education on a larger scale(Ahmad et al , 2024). Therefore, we hypothesize that:

H_5: *Reliability positively influences educational engagement among science students in private universities in Jordan.*

3.6 Reliability and Technology Integration in Science

One key is ensuring digital teaching materials are reliably integrated into educational settings. Educators and students are more apt to adopt a reliable technological tool that provides support. Such a behavior makes integrating these tools into scientific curriculum and everyday teaching practice easier because such tools function consistently and reliably(Al-Emran et al., 2020) These hypotheses aim to explore the use of open digital resources and their role in enhancing higher education engagement through technology integration at private universities. They also lay down some suggestions for optimizing such tools toward better educational outcomes in Jordan. As a result, we hypothesize that:

H_6: *Reliability positively influences technology integration in science education among students in private universities in Jordan.*

3.7 Technology Integration and Educational Engagement in Science

Effective technology integration is key in levering the engagement power of digital teaching materials in science education. Technology integration means that digital tools are not only a part of the new educational process but have been integrated into it in such a manner as to be effectively used by both educators and students (Gursoy & Chi, 2020). Besides, technology is better integrated into it to deliver an interactive learning experience, immediate feedback, and more engaging pathways. This full integration creates an educational environment that supports engagement and long-term interest in learning. This study will test the hypothesis of a direct impact of technology integration on educational engagement in science, shedding light on how digital teaching materials can be amended so they become conducive to student involvement and helping to address the low learning outcomes in Jordanian private universities. Therefore, we hypothesize that:

H_7: *Technology integration positively influences educational engagement among science students in private universities in Jordan.*

3.8 Reliability, Technology Integration, and Educational Engagement in Science

It shows that the reliability of digital teaching materials has a clear, positive effect on educational engagement in science; namely, technology integration plays a mediating role in educational engagement. The use of digital tools promotes sustained performance for service delivery and minimizes technical obstacles, thus facilitating educators to also practice the use of the same workload

device electronically (Alhawamdeh, 2024). Technology that works well and easily integrates becomes the background tool for which a consistent learning experience steers educational engagement. Therefore, we hypothesize that:

H_8: *Technology integration mediates the relationship between reliability and educational engagement among science students in private universities in Jordan.*

3.9 Assessment, Technology Integration, and Educational Engagement in Science

Assessing digital teaching materials is critical to understanding and improving their impact on educational engagement. (Lie et al., 2020) Metrics include usability, engagement, and learning outcomes to help us understand how technology can be better integrated into science classrooms. Assessments that are crafted to provide useful feedback and that knit effortlessly into a learning experience improve the utility of digital resources and educational engagement. Therefore, we hypothesize that:

H_9: *Technology integration mediates the relationship between assessment and educational engagement among science students in private universities in Jordan.*

3.10 Content Quality, Technology Integration, and Educational Engagement in Science

The quality of digital teaching materials is a key factor that affects the level at which educational engagement occurs mediated by technology integration. Useful content, which is correct and suitable to the learning or teaching need, helps a lot with learning (Spiteri & Chang Rundgren, 2020) By creating innovative ways to incorporate content in digital tools, technology is utilized thoughtfully, and the need for reliable resources is met. Therefore, we hypothesize that:

H_{10}: *Technology integration mediates the relationship between content quality and educational engagement among science students in private universities in Jordan.*

These underlying hypotheses are used to investigate how the mediating effect of technology integration contributes to the reliability, assessment, and content quality of digital teaching materials' educational engagement. This research shows how digital teaching materials can be enhanced to improve learning Science in private universities in Jordan.

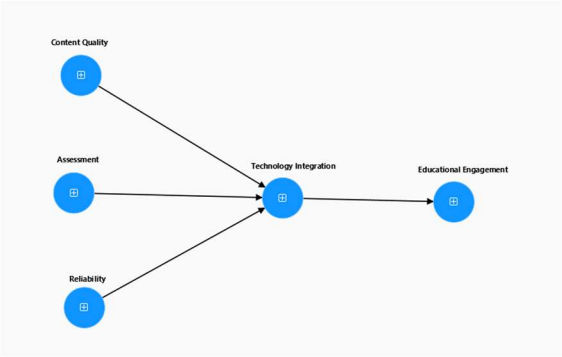

Fig. 1. Conceptual framework

4. Methodology

4.1 Research Design

This quantitative research was conducted to investigate the process of digital learning tools technology integration that has assisted student engagement in constructive information among science students at private universities in Jordan. The primary instrument for collecting information in the empirical research was a questionnaire.

4.2 Participants

This study was conducted in Jordan at several private universities with 158 educators, and administrators in scientific faculties. The survey questions used a 5-point Likert scale to determine whether participants agreed with statements regarding (1) digital teaching materials, technology integration, and educational engagement outcomes. Because of the varying academic structure of master's students in science specialists and as universities varied significantly from one to another, stratified random sampling was employed to be able to sample across all scientific streams and academic levels representatively (Daoud et al., 2024).

4.3 Data Collection

Descriptive olfactory practices were evaluated using a survey method comprising an objective measurement of all items in the present study. Initially, the survey was disseminated via email and online networks, with additional distributed sampling to capture

a wide array of participants. Participants were advised that their responses would be anonymous, and informed consent was obtained (Allahham & Ahmad, 2024). This approach allowed the researcher to comprehensive analysis of the impact of digital tools on science education.

4.4 Pretest

A pretest was conducted before the main study among 15 subjects from the target population to determine whether items in the questionnaire were understood to evaluate clarity, comprehensibility, and relevance. Precise feedback applied to the formulation and context of questions from these pre-tests helped in creating a final questionnaire that was valid for obtaining reliable data.

4.5 Pilot Testing

Before distribution, the survey underwent pilot testing to assess reliability and construct validity. To collect the appropriate number of responses from those working, a convenience sample was employed in pilot testing. Initial pilot survey: 158 valid responses from a sample population of 200. To reliably analyze the data, we have used software such as SmartPLS4. The reliability of the constructs was 0.7-1 usually above 0.9 by Cronbach's alpha coefficient, which represents an acceptable level of reliability. Factor loadings were high, with most factors in the 3 to 4 range and several above 90.

4.6 Data Analysis

The relationships among the measurements and variables were investigated with the Smart PLS4 application. Age and gender were described using descriptive statistics. The study used structural equation modeling (SEM) to explain the correlations between digital teaching materials, technology integration, and the learning performance of students. Reliability and Validity- These constructs were further tested for reliability and validity using Cronbach's alpha & factor loadings. Many of the results suggest that technology integration, at least in part, mediates the link between digital teaching materials on science students' engagement and outcomes among Jordanian private university students. The results have been analyzed and reported to provide us with ideas of how digital teaching materials suited for technology integration may improve science learning experiences in higher education.

Table 1
Factor loadings

Constructs	Items	Factor loadings	Cronbach's Alpha	C.R.	AVE
Assessment	AS1	0.808	0.91	0.93	0.69
	AS2	0.849			
	AS3	0.827			
	AS4	0.845			
	AS5	0.83			
	AS6	0.823			
Content Quality	CQ1	0.881	0.877	0.915	0.73
	CQ2	0.86			
	CQ3	0.859			
	CQ4	0.817			
Technology Integration	TI1	0.793	0.906	0.658	0.906
	TI2	0.832			
	TI3	0.818			
	TI4	0.866			
	TI5	0.802			
Educational Engagement	EE1	0.841	0.822	0.88	0.647
	EE2	0.839			
	EE3	0.747			
	EE4	0.787			
Reliability	RE1	0.817	0.889	0.919	0.694
	RE2	0.856			
	RE3	0.831			
	RE4	0.869			
	RE5	0.79			

Table 1 shows factor loadings, Cronbach's Alpha, Composite Reliability, and Average Variance Extracted for the constructs of Assessment Content Quality Technology Integration, Educational Engagement, and Reliability. The Factor Loadings of the construct Assessment are from 0.808 to 0.849 and have a high Cronbach's Alpha (0.91), C.R. (0.93) AVE (063). Content Quality displays factor loadings between 0.817 and zero881, Cronbach's Alpha of 0.877, C.R.0.915, AVE 0.73. These constructs display reliable measurement properties validated by high Cronbach's Alpha values in general and Composite Reliability and AVE, indicating consistent factor scale utilization and variance explanation being more than effective. The statistical strength of the results will enhance confidence in the reliability and validity of those measures used by the researcher.

4.7 Structural Model

To explore the relationships between variables, a SmartPLS4 application was applied with descriptive statistics for age and gender. The relationships between digital instructional materials, technology integration, and educational engagement and outcomes were explored using structural equation modeling (SEM). The reliability and validity of constructs were assessed through Cronbach's alpha and factor loadings. Results indicate that while digital materials do not directly affect educational engagement and outcomes, the integration of technology has an individual significant mediation mechanism. This emphasizes the need to introduce digital teaching resources and how effectively they are used in learning (Falloon, 2020). The focus on digital learning materials for the private universities in Jordan can be a key factor in increasing student engagement and educational outcomes, providing useful suggestions to educators and policymakers who would like more insights into enhancing technology integration.

Table 2
The results of HTMT

	Assessment	Content Quality	Educational Engagement	Reliability	Technology Integration
Assessment					
Content Quality	0.655				
Educational Engagement	0.442	0.588			
Reliability	0.57	0.798	0.703		
Technology Integration	0.535	0.563	0.439	0.594	

Table 2 presents HTMT ratio values of constructs Assessment, Content Quality, Educational Engagement, Reliability, and Technology Integration, as all HTMT values for all the constructs are below the 0.85 threshold acceptance level. The HTMT values of Assessment constructs are 0.655 with Content Quality, 0.442 with Educational Engagement, 0.57 between assessment and reliability, and 0.535 between assessment and technology. Furthermore, for Content Quality constructs, the HTMT values are 0.588 with Educational Engagement, 0.798 with Reliability, and 0.563 with Technology integration constructs. Also, Educate Engagement has HTMT values of 0.703 with reliability and 0.439 with Technology Integration constructs, while Reliability has a value of 0.594. These values confirm the good discriminant validity level of the focal constructs, as each construct is different from the others and measures different aspects of the research model, ensuring the overall validity.

Table 3
The results of Fronell-Larcker test

	Assessment	Content Quality	Educational Engagement	Reliability	Technology Integration
Assessment	0.83				
Content Quality	0.588	0.855			
Educational Engagement	0.372	0.487	0.805		
Reliability	0.518	0.709	0.575	0.833	
Technology Integration	0.478	0.493	0.382	0.525	0.811

Table 3 displayed the Fornell-Larcker Criterion values for the constructs of Assessment, Content Quality, Educational Engagement, and Reliability; the diagonal values show the square roots of this for each construct score Assessment, 0.83, Content Quality: 0.855, Educational Engagement; Technology Integration 0.811 which are all greater than those between off-diagonal correlation associated with constructs, Assessment's AVE 0.83 is higher than its correlations with Content Quality (0.588), Educational Engagement 0.372, Reliability 0.518, and Technology Integration 0.478. Similarly, for each construct, the AVE exceeds its correlations with other constructs concerned; hence, it speaks a bit about how these constructs are independent and measure separate dimensions in our conceptual framework adopted for this study. This represents the strong form, proof of concept, and validity of the measure used in the study.

Table 4
The results of R^2 Adjusted

	R-square	R-square adjusted
Educational Engagement	0.146	0.143
Technology Integration	0.342	0.334

Table 4 presents the R^2 and Adjusted R^2 values of both Educational Engagement and Technology Integration. This explains 14.3 percent of educational engagement ($R^2 = 0.146$, Adj $R^2 = 0.143$). Technology Integration Also has a better R^2 of 0.342, and Adjusted R^2 is 0.334, which accounts for about 33% variance above their mean square value score (Salas-Pilco et al., 2022). These values suggested that the predictive power of Technology Integration is moderate, while Educational Engagement explained much less variance with little adjustment for the number of predictors.

Table 5
Demographic information of respondents

Characteristic	Frequency	Percentage
University Sector		
Private Universities	86	46%
Private Colleges	58	31%
Other	58	23%
Role in Educational Administration		
Lab supervisor	49	26 %
Instructor	32	17%
Teaching Assistant	37	20 %
Sustainability Specialist	21	11 %
Other (Academic Advisors, Educational Consultants)	48	26%
Education Level		
Diploma	38	20%
Bachelor's Degree	94	50%
Master's/Doctorate Degree	55	30%
Experience		
Less than 10 years	27	14 %
10-14 years	49	26 %
15-19 years	43	23 %
20-24 years	31	17 %
25+ years	37	20 %

As shown in Table 5, the self-reported demographics of respondents are as follows: Private Universities 46%, Private Colleges 31% Other 23%. Lab supervisors (26%), Instructors 17%, Teaching Assistants 20%, sustainability specialists 11%, and other roles 26%. 50% have a bachelor's degree, 30% master's/doctorate, and 20% diploma equivalent. All experience levels exist, including 26% of participants having decades, 10-14 years' worth of work under their belt, and 23%, even more so, -15-19 years**.**

5. Hypotheses Testing

This research used path coefficient analysis and Smart PLS 4.0 software to investigate the relationships between digital teaching materials and technology integration on educational engagement and outcomes in higher education. Path coefficients are similar to beta weights in traditional regression analysis and show the strength of influence between constructs with a value from -1 to +1. If the coefficient is close to 1 or +1, it means that there exists a strong positive relation and if closed to 0 then its weakly related. These results were considered significant at $p \leq 0.05$ based on fitted parameters (coefficients), standard errors, t-values and derived P values from the best fitting regression equations for each variable of interest Cronbach's Alpha was calculated for the reliability and validity of constructs. The analysis result supported the proposed hypotheses. However, the current study also concludes technology integration mediates the relationship between digital teaching materials in science and educational engagement could have an effect on science education outcomes among this specific sample of students whose study in private universities in Jordan. Our findings indeed underscore that it is fundamental to better guarantee digital teaching materials' reliability in science to maximize educational impact (Qaisi & Saadon, 2023). The findings offer important lessons for educators and policy-makers on the necessity of strong, vetted digital content as a roadmap to drive educational decision-making supporting student learning science. This methodological manner yields helpful viewpoints for optimizing digital books' integration in HE.

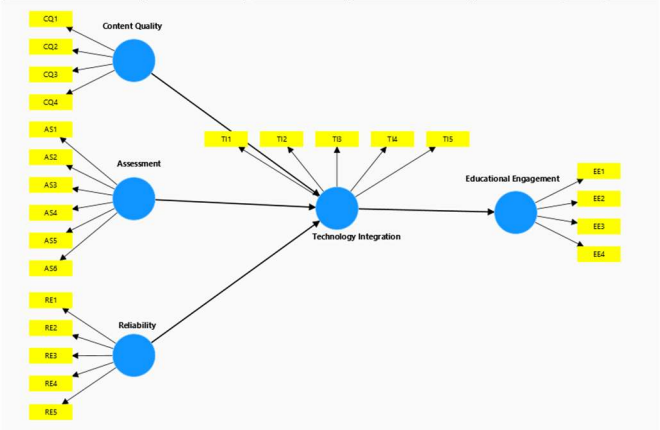

Fig. 2. Measurement Model

Fig. 2 portrays the relationship between content quality, assessment, technology integration reliability, and educational engagement. Four indicators represent each construct: CQ1-CQ4 for Content Quality, AS1-AS6 for Assessment RE1 - RE5 Reliability. From the model, direct paths from Content Quality, Assessment, and Reliability are made to Technology Integration, which proves that these three constructs directly influence technology integration. Direct educational engagement: Mediating role of Technology Integration. The theoretical relationships formed in this model involve the structural, process, and quality variables of private universities located in Jordan, which are significant mechanisms of educational outcomes in science education.

Table 6
Direct Path Coefficient Estimates for Hypotheses Testing

Hyp.	Relationships	Standardized Beta	Standard Error	T-Statistic	P-Values	Decision
H1	Assessment → Educational Engagement	0.092	0.033	2.796	0.005	Supported
H2	Assessment → Technology Integration	0.242	0.071	3.416	0.001	Supported
H3	Content Quality → Educational Engagement	0.052	0.036	1.453	0.146	Unsupported
H4	Content Quality → Technology Integration	0.135	0.082	1.643	0.101	Unsupported
H5	Reliability → Educational Engagement	0.116	0.046	2.514	0.012	Supported
H6	Reliability → Technology Integration	0.304	0.084	3.628	0	Supported
H7	Technology Integration → Educational Engagement	0.382	0.087	4.41	0	Supported

The estimates of hypothesis testing significantly impacted how digital teaching materials influence educational engagement through technology integration in teaching science. Both Digital Teaching Materials and Educational Engagement have strong relationships with Technology Integration as indicated by their low P-values 0.020; 0.000 and high standardized coefficients 0.168; 0,335 when mediated by Technology Integration. The hypothesis is supported because the P-value is less than 0.05, sufficient for statistical significance, and they have strong standardized coefficients indicating a large, robust effect size between the two variables. Conversely, much higher P-values, 0.326 and 0.318, suggest these relationships are not occurring in the Educational Engagement with Technology Integration and Digital Teaching Materials, respectively. For these relationships, the higher P-values indicate a lack of statistical significance and, therefore, the Relationship is unsupported. These research results suggest high-quality Digital Teaching Materials and Technology Integration enhance educational outcomes. They reinforce their role in enhancing educational effectiveness and competitive advantage rooted in technology-enabled learning. (Al-Twal & Cook, 2022) The supported pathways underscore that technology plays a role in teaching and learning science, while the unsupported pathways indicate other factors are affecting educational engagement and should be investigated further.

Table 7
Indirect Path Coefficient Estimates for Hypotheses Testing

Hyp.	Relationships	Standardized Beta	Standard Error	T-Statistic	P-Values	Decision
H8	Reliability → Technology Integration → Educational Engagement	0.116	0.046	2.514	0.012	Supported
H9	Assessment → Technology Integration → Educational Engagement	0.092	0.033	2.796	0.005	Supported
H10	Content Quality → Technology Integration → Educational Engagement	0.052	0.036	1.453	0.146	Unsupported

In Table 7 Both Reliability and Assessment in science show strong relationships with Technology Integration due to the low P-values, 0.012 and 0.005 for H8 and H9, respectively, and high standardized coefficients, 0.116 for H8 and 0.092 for H9, and thus support the hypotheses, as the P-values are less 0.05, enough for statistical significance. They have strong standardized coefficients, showing the variables' large and robust effect sizes. However, the higher P-value, 0.146, for the relationship between Content Quality and Educational Engagement in science through Technology Integration, or H10, shows that this relationship is insignificant and statistically insignificant, thus leading to the in supportability as shown in hypothesis H10. Those research results thus show that high reliability and assessment practices in science, when applied to technology, promote educational engagement due to the reinforcing role of technology in education and the competitive advantage of education based on technology learning.
In contrast, the relationship between Content Quality and Educational Engagement mediated by Technology Integration in science is an unsupported pathway. These findings show that reliability and assessment in science are important for influencing educational engagement through technology integration, and science content quality, on its own, does not significantly impact educational engagement through technology integration. Therefore, whether science content quality matters or not should be further studied.

6. Findings

The data collected from this research offer valuable insights into how digital teaching materials and technology integration affect educational engagement in the context of science education at private universities in Jordan. The results indicate that digital

teaching materials, when effectively integrated with technology, significantly enhance educational engagement among science students. Specifically, technology integration was found to play a crucial mediating role, improving students' engagement with digital teaching resources and thus leading to better educational outcomes. Technology integration had a mediating role of effect on science students' engagement with digital teaching materials. This, in turn, means that the more a given technology integration process is perceived as effective, the more students are moved toward engagement in science education. When this action happens through digital teaching materials, proper educational outcomes can be delivered. The research also supports the idea that better technology integration negatively affects students' attitudes toward digital teaching materials and indirectly leads to higher educational engagement in increased learning outcomes in science by improving technological skills (Ivers & University-Idaho, 2007). Digital teaching resources will connect with the necessity for consistent and successful educational technology in academic, and scientific contexts for educators. The research's theoretical implication is to present technology integration as a mediator in the relationship between digital teaching materials and educational engagement among science students. Findings underscore the importance of educational institutions addressing technology integration to optimize the impact digital teaching materials may have on engagement in science education. Jordanian private universities are urged to adopt methods that promote the effectiveness of technology integration, such as enhancing students' digital literacy and ensuring educators and administrators use robust technological tools in science education (Almustafa et al., 2023). This study, limited by sampling issues including potential biases, offers a more nuanced understanding of how technology integration influences the effects of digital curricular materials on educational engagement among science students. They could provide a framework for contextualized variables in future analyses. The findings illustrate that effective technology integration will mediate the relationship between digital teaching materials and educational engagement in science education & show important reflections to inspire additional use of digital teaching materials among private universities in Jordan.

7. Managerial Implications

The study has an important managerial contribution for university administrators and educators in the private universities within Jordan to provide insight into how knowledge enhancement outcomes can be improved based on effective technologies mediated with digital teaching materials in science education (Jawabreh et al., 2023). The findings emphasized the role of technology integration in contributing to enhanced educational engagement. Priority is improving the efficiency and dependability of educational technology. It is thus crucial to embed holistic digital literacy and skills within the education system, supporting science students in effectively using online teaching materials and the recourses. Learners need ongoing training, workshops, online courses, and resource guides to integrate technology into science teaching and stay updated with the newest digital tools. Administrators must ensure that digital teaching materials are valuable to science education through rigorous content evaluation and collaboration with expert reviewers and top users. Digital content must be consistent, credible, and connected to a university's goals. Managerial implications underscore the need for educational establishments to combine technological initiatives with academic objectives to continue winning and gaining competitive leverage over academia and to enhance the learning experience for their science students.

8. Limitations and Future Research

This research provides important thrice implications by extending the influence of digital teaching materials on educational engagement, directly affecting the mediator role of technology integration in science education in Jordanian private universities. As with all studies, however, the findings to this need should be pants cautiously due to several limitations. The first major limitation is the cross-sectional design, which limits the evidence to scoring snapshots and offers a snapshot of digital teaching resources and technology integration in educational interaction in science. The results of this study should be validated in other educational systems situated in different geo-political regions because this study applies to the private universities in Jordan where the data was collected. This study could be complemented by qualitative methods, such as interviews or focus groups, to explore in greater detail how stakeholders interact with digital teaching materials integration technology. Exploring the roles of digital literacy and social influence, as well as more distal engagement outcomes, could contribute to a better understanding of how broader areas related to educational engagement mediate this relationship concerning use. These approaches have the potential to greatly expand the theoretical bases and practical usability of educational technology in engagement. According to our results, they can be used in future research by providing a firm foundation and enlightening educators about transitional digital teaching materials integration into science education.

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References

Ahmad, A. Y. B., Tiwari, A., Nayeem, M. A., Biswal, B. K., Satapathy, D. P., Kulshreshtha, K., & Bordoloi, D. (2024). Artificial Intelligence Perspective Framework of the Smart Finance and Accounting Management Model. *International Journal of Intelligent Systems and Applications in Engineering, 12*(4s), 586-594.

Akram, H., Yingxiu, Y., Al-Adwan, A. S., & Alkhalifah, A. (2021). Technology Integration in Higher Education During COVID-19: An Assessment of Online Teaching Competencies Through Technological Pedagogical Content Knowledge Model. *Frontiers in Psychology, 12*(August), 1–11. https://doi.org/10.3389/fpsyg.2021.736522

Al-Awidi, H, Abumosa, M & Al-Mughrabi, A. (2024). The effect of mobile image recognition-based augmented reality application on students' acquisition of science processing skills and motivations to learn science. *Interactive Learning Environments*, DOI: 10.1080/10494820.2024.2367020

Al-Emran, M., Arpaci, I., & Salloum, S. A. (2020). An empirical examination of continuous intention to use m-learning: An integrated model. *Education and Information Technologies, 25*(4), 2899–2918. https://doi.org/10.1007/s10639-019-10094-2

Al-Twal, A., & Cook, C. (2022). Explaining the power of informal networks in academia: a Jordanian perspective. *Journal of Further and Higher Education, 46*(6), 807–821. https://doi.org/10.1080/0309877X.2021.2008331

Alenezi, A. (2020). The role of e-learning materials in enhancing teaching and learning behaviors. *International Journal of Information and Education Technology, 10*(1), 48–56. https://doi.org/10.18178/ijiet.2020.10.1.1338

Ali, W. (2020). Online and Remote Learning in Higher Education Institutes: A Necessity in light of COVID-19 Pandemic. Higher Education Studies, 10(3), 16. https://doi.org/10.5539/hes.v10n3p16

Allahham, M., & Ahmad, A. Y. B. (2024). AI-induced anxiety in the assessment of factors influencing the adoption of mobile payment services in supply chain firms: A mental accounting perspective. *International Journal of Data and Network Science, 8*(1), 505–514. https://doi.org/10.5267/j.ijdns.2023.9.006

Alhawamdeh, H., Al-Saad, S. A., Almasarweh, M. S., Al-Hamad, A. A.-S. A., Bani Ahmad, A. Y. A. B., & Ayasrah, F. T. M. (2023). The Role of Energy Management Practices in Sustainable Tourism Development: A Case Study of Jerash, Jordan. *International Journal of Energy Economics and Policy, 13*(6), 321–333. https://doi.org/10.32479/ijeep.14724

Atieh Ali, A. A., Sharabati, A. A., Alqurashi, D. R., Shkeer, A. S., & Allahham, M. (2024). The impact of artificial intelligence and supply chain collaboration on supply chain resilience: Mediating the effects of information sharing. *Uncertain Supply Chain Management, 12,* 1801–1812. https://doi.org/10.5267/j.uscm.2024.3.002

Bani Ahmad, A. Y. A., William, P., Uike, D., Murgai, A., Bajaj, K. K., Deepak, A., & Shrivastava, A. (2024). Framework for Sustainable Energy Management using Smart Grid Panels Integrated with Machine Learning and IOT-based Approach. *International Journal of Intelligent Systems and Applications in Engineering, 12*(2s), 581–590.

Bond, M., Buntins, K., Bedenlier, S., Zawacki-Richter, O., & Kerres, M. (2020). Mapping research in student engagement and educational technology in higher education: a systematic evidence map. *International Journal of Educational Technology in Higher Education, 17*(1). https://doi.org/10.1186/s41239-019-0176-8

Butler, L. H., Lamont, P., Wan, D. L. Y., Prike, T., Nasim, M., Walker, B., Fay, N., & Ecker, U. K. H. (2024). The (Mis)Information Game: A social media simulator. *Behavior Research Methods, 56*(3), 2376–2397. https://doi.org/10.3758/s13428-023-02153-x

Cabero-Almenara, J., Guillén-Gámez, F. D., Ruiz-Palmero, J., & Palacios-Rodríguez, A. (2022). Teachers' digital competence to assist students with functional diversity: Identification of factors through logistic regression methods. *British Journal of Educational Technology, 53*(1), 41–57. https://doi.org/10.1111/bjet.13151

Choi, J. H., Miller, D. D., & McCart, A. B. (2024). Outcomes of Equity-Based Multi-Tiered System of Support and Instructional Decision-Making for Autistic Students. *Education Sciences, 14*(7). https://doi.org/10.3390/educsci14070708

Daoud, M. K., Taha, S., Al-Qeed, M., Alsafadi, Y., Bani Ahmad, A. Y. A., & Allahham, M. (2024). Ecoconnect: Guiding environmental awareness via digital marketing approaches. *International Journal of Data and Network Science, 8*(1), 235–242. https://doi.org/10.5267/j.ijdns.2023.9.028

Darmaji, D., Astalini, A., Kurniawan, D. A., Chen, D., Wirayuda, R. P., & Winda, F. R. (2022). Investigation Gender Difference Towards Science Process Skills (SPS) Using Problem-Based Learning. *Cypriot Journal of Educational Science, 17*(10), 3849-3862.

Deng, R., Benckendorff, P., & Gannaway, D. (2020). Learner engagement in MOOCs: Scale development and validation. *British Journal of Educational Technology, 51*(1), 245–262. https://doi.org/10.1111/bjet.12810

Falloon, G. (2020). From digital literacy to digital competence: the teacher digital competency (TDC) framework. *Educational Technology Research and Development, 68*(5), 2449–2472. https://doi.org/10.1007/s11423-020-09767-4

Gursoy, D., & Chi, C. G. (2020). Effects of COVID-19 pandemic on hospitality industry: a review of the current situations and a research agenda. *Journal of Hospitality Marketing and Management, 29*(5), 527–529. https://doi.org/10.1080/19368623.2020.1788231

Hasanah, N., Syaifuddin, M., Darmayanti, R., & In'am, A. (2022). Analysis of the Need for Mathematics Teaching Materials "Digital Comic Based on Islamic Values" for Class X SMA Students in Era 5.0. *Numerical: Jurnal Matematika Dan Pendidikan Matematika, 6*(2), 231–240. https://journal.iaimnumetrolampung.ac.id/index.php/numerical/article/view/2584

Harahap, F., Nasution, N. E. A., & Manurung, B. (2019). The effect of blended learning on student's learning achievement and SPS in plant tissue culture course. *International Journal of Instruction, 12*(1), 521–538. https://doi.org/10.29333/iji.2019.12134a

Haviz, M., Karomah, H., Delfita, R., Umar, M. I. A., & Maris, I. M. (2018). Revisiting generic science skills as 21st-century skills on biology learning. *Jurnal Pendidikan IPA Indonesia, 7*(3), 355–363. https://doi.org/10.15294/jpii.v7i3.12438

Indah Nurcahyani, D., & Budi Prabowo. (2024). Pengaruh Brand Awareness, Brand Image, dan Brand Trust tehadap Brand Loyalty Pengguna Skincare Skintific: Studi Pada Pelanggan Moisturizer Skintific Melalui E-Commerce Shopee di Wilayah Surabaya. *Al-Kharaj: Jurnal Ekonomi, Keuangan & Bisnis Syariah, 6*(5), 3753–3766. https://doi.org/10.47467/alkharaj.v6i5.1223

Ivers, J. J., & University-Idaho, B. Y. (2007). F Oreign L Anguage C Lass. *Language, 55*(3), 55–68.

Jawabreh, O., Baadhem, A. M., Ali, B. J. A., Atta, A. A. B., Ali, A., Al-Hosaini, F. F., & Allahham, M. (2023). The Influence of Supply Chain Management Strategies on Organizational Performance in Hospitality Industry. *Applied Mathematics and Information Sciences, 17(*5), 851–858. https://doi.org/10.18576/AMIS/170511

Juhji, J., & Nuangchalerm, P. (2020). Interaction between scientific attitudes and SPS toward technological pedagogical content knowledge. *Journal for the Education of Gifted Young Scientists, 8*(1), 1–16. https://doi.org/10.17478/jegys.600979.XX

Kotorov, I., Krasylnykova, Y., Pérez-Sanagustín, M., Mansilla, F., & Broisin, J. (2024). Supporting Decision-Making for Promoting Teaching and Learning Innovation: A Multiple Case Study. *Journal of Learning Analytics, 11*(1), 21–36. https://doi.org/10.18608/jla.2024.8131

Kuutila, M., Kiili, C., Kupiainen, R., Huusko, E., Li, J., Hosio, S., Mäntylä, M., Coiro, J., & Kiili, K. (2024). Revealing complexities when adult readers engage in the credibility evaluation of social media posts. *Computers in Human Behavior, 151,* 1–25. https://doi.org/10.1016/j.chb.2023.108017

Lai, P. L., Su, D. T., Tai, H. H., & Yang, C. C. (2020). The impact of collaborative decision-making on logistics service performance for container shipping services. *Maritime Business Review, 5*(2), 175–191. https://doi.org/10.1108/MABR-12-2019-0061

Li, K., Wijaya, T. T., Chen, X., & Harahap, M. S. (2024). Exploring the factors affecting elementary mathematics teachers' innovative behavior: an integration of social cognitive theory. *Scientific Reports, 14*(1), 1–14. https://doi.org/10.1038/s41598-024-52604-4

Lie, A., Tamah, S. M., Gozali, I., Triwidayati, K. R., Utami, T. S. D., & Jemadi, F. (2020). Secondary School Language Teachers' Online Learning Engagement During the Covid-19 Pandemic in Indonesia. *Journal of Information Technology Education: Research, 19*, 803–832. https://doi.org/10.28945/4626

Liew, S. S., Lim, H. L., Saleh, S., & Ong, S. L. (2019). Development of scoring rubrics to assess physics practical skills. *Eurasia Journal of Mathematics, Science and Technology Education, 15*(4). https://doi.org/10.29333/ejmste/103074

Maulina, M., & Yustika, S. (2022). Research methods in teaching and learning pronunciation using social media and technological tools. *Harvest: An International Multidisciplinary and Multilingual Research Journal, 2*(1), 55–63.

Moyano-Fuentes, J., Maqueira-Marín, J. M., Martínez-Jurado, P. J., & Sacristán-Díaz, M. (2021). Extending lean management along the supply chain: impact on efficiency. *Journal of Manufacturing Technology Management, 32*(1), 63–84. https://doi.org/10.1108/JMTM-10-2019-0388

Pandey, S. R. (2023). Passion and Quest for Quality in Education. *Journal of Social Work and Science Education, 4*(3), 705–716. https://doi.org/10.52690/jswse.v4i3.427

Pham, Q. V., Fang, F., Ha, V. N., Piran, M. J., Le, M., Le, L. B., Hwang, W. J., & Ding, Z. (2020). A Survey of Multi-Access Edge Computing in 5G and Beyond Fundamentals, Technology Integration, and State-of-the-Art. *IEEE Access, 8*, 116974–117017. https://doi.org/10.1109/ACCESS.2020.3001277

Qaisi, Y. T. Al, & Saadon, M. S. (2023). The Impact of Electronic Human Resource Management Practices on Talent Management in Private Jordanian Universities : The Mediating Role of Top Management Support. *Res Militaris, 13*(1), 1819–1839.

Qian, Y., Wang, J., & Cai, Y. (2023). Revolutionizing educational landscapes: A systematic review of Metaverse applications, paradigms, and emerging technologies. *Cogent Education, 10*(2). https://doi.org/10.1080/2331186X.2023.2264006

Salas-Pilco, S. Z., Yang, Y., & Zhang, Z. (2022). Student engagement in online learning in Latin American higher education during the COVID-19 pandemic: A systematic review. *British Journal of Educational Technology, 53*(3), 593–619. https://doi.org/10.1111/bjet.13190

Sekaran, U., & Bougie, R. (2016). Research methods for business : a skill-building approach / Uma Sekaran and Roger Bougie. In Nucleic Acids Research.

Shqair, M. I., & Altarazi, S. A. (2022). Evaluating the Status of SMEs in Jordan for Industry 4.0: A Pilot Study. *Logistics, 6*(4). https://doi.org/10.3390/logistics6040069

Sinsel, S. R., Riemke, R. L., & Hoffmann, V. H. (2020). Challenges and solution technologies for the integration of variable renewable energy sources—a review. *Renewable Energy, 145,* 2271–2285. https://doi.org/10.1016/j.renene.2019.06.147

Spiteri, M., & Chang Rundgren, S. N. (2020). Literature Review on the Factors Affecting Primary Teachers' Use of Digital Technology. *Technology, Knowledge and Learning, 25*(1), 115–128. https://doi.org/10.1007/s10758-018-9376-x

Tang, A., Li, K. K., Kwok, K. O., Cao, L., Luong, S., & Tam, W. (2024). The importance of transparency: Declaring the use of

generative artificial intelligence (AI) in academic writing. *Journal of Nursing Scholarship, 56*(2), 314–318. https://doi.org/10.1111/jnu.12938

Tarifa-Rodriguez, A., Virues-Ortega, J., & Calero-Elvira, A. (2024). The Behavioral Education in Social Media (BE-Social) Program for Postgraduate Academic Achievement: A Randomized Controlled Trial. *Journal of Behavioral Education,* 0123456789. https://doi.org/10.1007/s10864-024-09545-9

Temilade Abass, Michael Alurame Eruaga, Esther Oleiye Itua, & James Tabat Bature. (2024). Advancing Food Safety Through IoT: Real-Time Monitoring and Control Systems. *International Medical Science Research Journal, 4*(3), 276–283. https://doi.org/10.51594/imsrj.v4i3.919

Tiwari, S., Ali Raza, S., Kumar Gupta, S., Shahzadi, I., & Babu Kuruva, M. (2024). Testing the LCC hypothesis by considering environmental sustainability and economic development: Role of green energy and resource management. *Geoscience Frontiers, 15*(3), 101666. https://doi.org/10.1016/j.gsf.2023.101666

Tkacová, H., Králik, R., Tvrdoň, M., Jenisová, Z., & Martin, J. G. (2022). Credibility and Involvement of Social Media in Education—Recommendations for Mitigating the Negative Effects of the Pandemic among High School Students. *International Journal of Environmental Research and Public Health, 19*(5), 1–22. https://doi.org/10.3390/ijerph19052767

Torlak, N. G., Demir, A., & Budur, T. (2022). Decision-making, leadership, and performance links in private education institutes. *Rajagiri Management Journal, 16*(1), 63–85. https://doi.org/10.1108/ramj-10-2020-0061

Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences, 39*(2), 273–315. https://doi.org/10.1111/j.1540-5915.2008.00192.x

Viere, T., Amor, B., Berger, N., Fanous, R. D., Arduin, R. H., Keller, R., Laurent, A., Loubet, P., Strothmann, P., Weyand, S., Wright, L., & Sonnemann, G. (2021). Teaching life cycle assessment in higher education. *International Journal of Life Cycle Assessment, 26*(3), 511–527. https://doi.org/10.1007/s11367-020-01844-3

Wang, J., Sciarrino, F., Laing, A., & Thompson, M. G. (2020). Integrated photonic quantum technologies. *Nature Photonics, 14*(5), 273–284. https://doi.org/10.1038/s41566-019-0532-1

Zutiasari, I.(2021). Development of Digital Sway Teaching Materials for Online Learning in the COVID-19 Pandemic Era. *KnE Social Sciences, 2021*, 200–209. https://doi.org/10.18502/kss.v5i8.9359