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Can Gender Moderate the Effect of Digital Learning Media and Interest on Learning Outcomes?

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Abstract

The purpose of this study is to analyse the effect of digital learning media and learning interest on learning outcomes based on gender. This study uses a quantitative approach with Structural Equation Modelling (SEM) through Multi-Group Analysis (MGA), involving 254 students from Madrasah Tsanawiyah in Singosari, Malang, to measure the effect of digital learning media and student learning interest on learning outcomes. The results of structural test showed that neither digital learning media nor learning interest had a significant effect on learning outcomes, and gender did not moderate the relationship. Further, based on PLS-MGA, it is found that gender did not moderate the relationship in the model. Suggestions for future research include exploring the relationship between students' learning styles and the use of learning media, conducting longitudinal studies to evaluate the long-term impacts of digital learning media on outcomes, and considering factors such as personality, motivation, and age differences as moderating variables to gain a more comprehensive understanding of their effects on student learning outcomes.

Keywords: Digital Learning Media, Learning Interest, Learning Outcomes, Gender

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Introduction

Education is the key to a better future and an important investment in preparing the younger generation to build the country. The quality of education depends on teachers' competencies, which include pedagogic, personality, professional and social, as a form of responsibility for providing education services (Ningsih & Siagian, 2020). Teachers are expected to not only apply, but also develop learning media (Fajri, Priyono, & Kusumohadi, 2021). According to Law No. 20/2003 Article 1, education is planned to create a learning process that encourages students to develop their potential in various aspects. The quality of human resources in mastering science and technology, especially in the era of the Industrial Revolution 4.0, greatly affects the progress of the nation (Verma & Venkatesan, 2022). Therefore, the standard of education in Indonesia needs to be improved to keep up with the rapid development of technology.

Nowadays, there are many learning media, especially digital learning media that are increasingly advanced and can be used in various ways. Digital learning media are tools and resources that utilise digital technology to support learning, including software, applications, online platforms and interactive materials designed to enhance the learning experience (Akrim, 2018). The effective application of digital media and technology can attract students' attention, increase interest and encourage active engagement in the learning process which affects motivation and optimal academic achievement (Afifa & Astuti, 2024; Bunari et al., 2024; Delıta, Berutu, & Nofrıon, 2022). Research conducted by Sumoked et al. (2021) showed that the use of

digital media can have a positive impact on students' communication skills. Heryani et al. (2022) added that digital learning media can improve digital literacy skills. In addition, digital learning media can also hone students' critical thinking skills (Jannah & Atmojo, 2022).

Although the use of learning media has a positive impact, many students in Indonesia experience low interest in learning and poor academic performance due to, lack of access to technology, unsupportive learning environments, as well as teachers' tendency to choose conventional, passive educational approaches (Korompot, Rahim, & Pakaya, 2020; Nabillah & Abadi, 2020). In addition, (Goleman, 2000) states that gender also affects students' conditions for learning, where men and women show emotional differences that reflect social roles and interpersonal relationships, with women being more open in expressing feelings. This is supported Setiawati & Arsana (2018) and Utami & Yonanda (2020) howing that female and male students have different responses to the learning process, so an understanding of these differences is very important to design learning strategies that are more effective and in accordance with student needs.

An interview with the Vice Curriculum at a Madrasah Tsanawiyah in Singosari, Malang, stated that the use of digital learning media is very helpful in the learning process, especially in improving the quality of learning. According to him, YouTube is used more often because it offers audio and visuals that are attractive to students. From the observation, students seem to enjoy learning that involves digital learning media. However, there are still some obstacles, such as many teachers who still use the lecture method, restrictions on access to technology and teacher-centred learning.

Several studies have shown that digital learning media can improve student enquiry and learning outcomes (Afaria, Sudjani, & Rachma, 2022; Alwi, Halimah, Susanti, & Marcelina, 2023; Fauziyah, Ramadhini, Wardhana, & Hidayat, 2022; Muriani, Rahmatika, & Yeni, 2023). Research conducted by Sari et al. (2023) and Ruswan et al. (2024) explained that digital learning media had a significant effect on students' literacy skills. In addition, the results of research by Zulhelmi et al. (2017) and Lesmana et al. (2023) showed that high interest in learning will affect student learning outcomes. However, research related to digital learning media and learning interest on learning outcomes based on spatial gender has never been found by researchers, so it needs to be researched, especially in one of the Madrasah Tsanawiyah in Singosari, Malang. Thus, this study aims to determine the effect of digital learning media and interest in learning on student learning outcomes based on gender.

Literature Review

Digital Learning Media

Digital learning media refer to the use of various digital technology-based hardware and software to support the learning process (Akbar et al., 2023). It includes devices such as computers, tablets, learning applications, videos, animations, and online learning platforms that enable interaction between students and materials digitally (Dahlan, Darhim, & Juandi, 2022). This media offers various advantages, such as increasing interactivity, flexibility, and personalisation in learning, as well as allowing easier access anytime and anywhere (Akrim, 2018). Types of digital learning media include learning apps, educational videos, animations, and online learning management platforms (LMS) all designed to enrich students' learning experience (Syarifuddin & Utari, 2022). While they provide significant benefits such as higher student engagement and more engaging learning, digital learning media also face challenges related to limited access to technology, teacher and student readiness to use technology, and potential distractions that can reduce their effectiveness.

Learning Interest

Interest in learning is a feeling of interest, curiosity, or desire to learn something that arises from within the individual, which can affect the enthusiasm and motivation to learn (Renninger, 2014). According to James & Joe (2014), learning interest reflects personal preferences that direct individual attention to certain topics, which have an impact on cognitive processes and positive emotions. Students who have an interest in learning tend to be more eager and active in participating in learning, as explained by Achru (2019) who emphasises that interest can increase

students' emotional and cognitive engagement. This interest is also reflected in the actions of students who prefer and are more involved in certain activities, as described by Korompot et al. (2020). According to Fahrudin, Ansari, & Ichsan (2021), enjoyment is a connecting factor between interest, values, and knowledge, and plays a role in increasing student engagement.

Learning Outcomes

Learning outcomes refer to the expected achievement after the learning process is complete, which is usually measured through tests or evaluations (Rini, Firmansyah, Widiastuti, Christyowati, & Fatirul, 2023). According to Palittin, Wolo, & Purwanty (2019), learning outcomes describe the level of student success in learning subject matter, which is expressed in test scores. The focus of learning outcomes is on students and their learning process, not on the teacher or the material taught (Popenici & Millar, 2015). Effective learning requires a varied approach, as various teaching factors can affect student learning outcomes (Yeh & Fu, 2014). Learning outcomes also include students' ability to apply learnt knowledge in a practical context (Nabillah & Abadi, 2020). Altun & Yildirim (2023) added that learning outcomes are knowledge and skills acquired through experience.

Method

This study uses a quantitative approach using Partial Least Square-Structural Equation Modelling (PLS-SEM) through Multi-Group Analysis (MGA) (J. Hair, Hollingsworth, Randolph, & Chong, 2017). The study population was students in the largest Madrasah Tsanawiyah school in the Singosari area, Malang, totalling 706 students, with a sample determined through random sampling techniques and the Slovin formula, which was 254 students. Data collection was conducted with two types of data, namely primary, in the form of questionnaires measuring digital learning media through theory Akbar et al. (2023) and student learning interest through Dan & Todd (2013). Secondary data in the form of student learning outcomes data. The framework for thinking in this study can be seen in Figure 1.

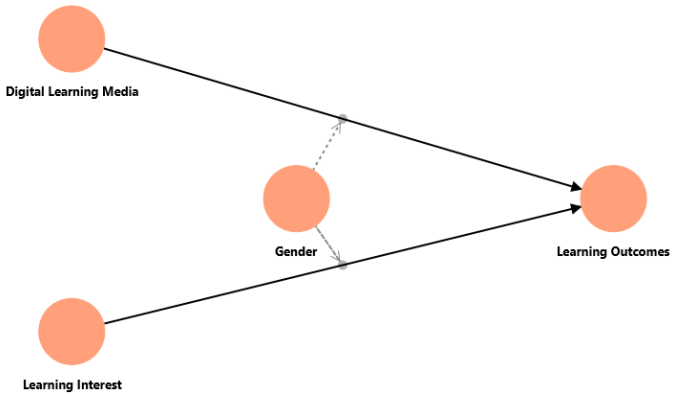

Figure 1. Research Framework

Some of the analyses conducted in this study include the Measurement model assessment test which is used to test the validity and reliability of variable indicators. Testing includes outer loading with a minimum value above 0.4 (J. F. Hair, Risher, Sarstedt, & Ringle, 2019). After that, the composite reliability test is used to measure the internal reliability of a construct as a whole. (Hair et al., 2019). AVE measures the proportion of variance that can be explained by the construct from its indicators. The desired AVE value should be greater than 0.5, which indicates that the construct can explain more than 50% of the variance of its indicators. Cronbach's Alpha and Composite Reliability (CR) are reliability measures that assess the internal consistency between indicators used to measure a construct. The value is good to be above 0.6, the

discriminant validity test uses the Heterotrait-Monotrait Ratio (HTMT) method, the maximum recommended HTMT value is 0.85.

Furthermore, the Structural Model test is carried out to evaluate the strength and direction of the relationship between constructs in the model. The path coefficient value shows how much influence one construct has on other constructs. The significance of this relationship is tested using t-statistics or p-values, where t-statistics above 1.96 at the 5% significance level indicate that the relationship is significant. In addition, the Partial Least Squares Multi-Group Analysis (PLS-MGA) test was used to identify differences in effects between groups in the research model. MGA allows an assessment of whether there are significant differences between groups, such as those based on gender. The difference in path coefficients between groups is measured, and if the p-value is below 0.05, then there is a significant difference between groups.

Results and Discussion

In this study, the sample consisted of 112 male students and 142 female students. The learning media variable which initially consisted of 13 indicators, only 4 indicators met the validity and reliability criteria, while the others were deleted because the outer loading value was below 0.4.Likewise, with the learning interest variable, which consisted of 13 questions, only 5 questions were valid after testing, while the others were also deleted because they did not meet the validity standards. See in table 1.

Table 1. Measurement Model Assessment Result

Variable	Item	Outer Loading Value	Cronbach's Alpha	AVE	Composite Reliability
Media Pembelajaran Digital	MPD 11	0.847	0,856	0,697	0,902
	MPD 3	0.881			
	MPD 7	0.819			
	MPD 8	0.790			
Minat Belajar	MNT1	0.623	0,927	0,785	0,947
	MNT10	0.956			
	MNT6	0.880			
	MNT8	0.964			
	MNT9	0.959			

Source: Data Processed

From Table 1. The results of the Validity test on the Outer Model Test in full or as a whole, it can be seen that all indicators are above 0.4, aka valid. Furthermore, the Cronbach's alpha and Composite Reliability (CR) values show a value above 0.7 which indicates that the item is declared reliable. Then, for the overall value of Averaga Variance (AVE) above the average of 0.5 and means that all data is good or valid. After that, the Discriminant Validity Test was tested using the Heterotrait-Monotrait Ratio (HTMT) method.

Table 2. Discriminant Validity Test with Heterotrait-Monotrait Ratio Method (HTMT)

Variable	Learning Outcomes
Digital Learning Media	0,068
Learning Interent	0,058

Source: Data Processed

Based on table 2, it is shown that the tested constructs have good discriminant validity values, namely the HTMT value is less than 0.85. This means that the constructs can be clearly distinguished from each other. The next step is to test the hypothesis. The inner model test shows the relationship between latent constructs and other latent constructs. Table 3 shows the estimated direct effect path coefficients tested through bootstraping.

Table 3. Structural Test Model Direct Effect Result

Relationship Between Variables	T Static	P-Value	Description
Digital Learning Media – Learning Outcomes	0,861	0.389	Not Significant
Learning Interest – Learning Outcomes	0,904	0,366	Not Significant

Source: Data Processed

Based on Table 3, the analysis results show that digital learning media has no significant effect on learning outcomes. This can be seen from the t-statistic value which reaches 0.861, which is smaller than 1.96 (t-statistic > 1.96), as well as a p-value of 0.389 which is greater than 0.050 (p-value < 0.050). Learning interest also proved to have no significant effect on learning outcomes. The analysis results show that the t-statistic value for financial literacy is 0.904 which is also smaller than 1.96 (t-statistic > 1.96), with a p-value of 0.366 which is greater than 0.050 (p-value < 0.050).

Some studies show that digital learning media is not always directly related to improved student learning outcomes. Isroani, Jaafar, & Muflihaini (2022) stated that although digital media offers ease of access. Unstructured use and without the right pedagogical approach can make digital media not have a significant impact on student learning outcomes. Putri & Citra (2019) argue that learning media only serves as a tool, and cannot replace the quality of proper teaching. If not used in an appropriate way, media can even distract students from the core material that must be learnt. In addition Nursobah (2021) notes that the evaluation of learning outcomes through the use of digital media, such as YouTube, is considered less transparent. YouTube is not designed for educational evaluation purposes and provides no way to directly measure student understanding. Without clear interaction and feedback, evaluation through this platform is less effective and it is difficult to ascertain the extent to which students understand the material taught.

This is contrasted by research conducted by Rosmana et al. (2023) who found that the use of PowerPoint in learning is effective, as evidenced by the 18.4% increase in students' average score. PowerPoint helps present the material in a more structured and interesting way, improving student understanding through a combination of text, images, and animation. Research by Narestuti, Sudiarti, & Nurjanah (2021) shows that the application of digital comic media can also improve student learning outcomes, from 61% in the first cycle to 93% in the second cycle. Novita & Novianty (2020) concluded that animation media has a positive influence on student learning outcomes. Animation helps clarify concepts that are difficult to understand and makes the learning process more dynamic and interesting, which increases student engagement.

Research shows that learning interest on student learning outcomes has many factors that influence it. Hidi & Harackiewicz (2000) state that peer influence is often more dominant than individual interest in influencing student learning outcomes. Nakanishi (2015) also noted that although interactive teaching methods can increase student interest, this does not always lead to a significant increase in learning scores. Meanwhile, research by Lubis, Solehudin, & Safitri (2024) howed that interest in learning is not always directly related to learning motivation, and there is no significant relationship between learning media and facilities with learning outcomes. Schiefele (1991) urther suggests that interest in learning is often influenced by diverse external factors, such as social environment and support from parents. On the other hand, Harefa et al. (2023) revealed that students who feel comfortable, realise the benefits of learning, and understand the learning objectives tend to have higher interest, which ultimately improves their learning outcomes. Research also shows that approaches such as Project-Based Learning (PBL) can increase interest in learning, which leads to better learning outcomes (Permatasari, Gunarhadi, & Riyadi, 2019). In addition, Harefa (2023) and D. T. Setiawati, Halimah, & Budiyanti, 2024) found a positive relationship between learning interest and learning outcomes, with a significant correlation, indicating that high learning interest can encourage students to be more active and successful in learning.

Furthermore, moderation testing was carried out using multi-group analysis, as presented in Table 4 to analyse whether there are differences in moderation effects based on gender on the relationship between the variables studied.

Table 4. Gender Moderation Multi Group Analyse Test Results

Relationship Between Variables	Male	Female	Male	Female
	P-Value		Description	
Digital Learning Media – Learning Outcomes	0,536	0,166	Not Significant Moderating	Not Significant Moderating
Learning Interest – Learning Outcomes	0,212	0,514	Not Significant Moderating	Not Significant Moderating

Source: Data Processed

Based on Table 4, the test results using multi-group analysis, it was found that there is no significant difference between male and female gender in moderating the relationship between digital learning media and learning outcomes, as well as learning interest and learning outcomes. In other words, differences in gender, whether male or female, do not have a different impact on the effects of these two factors on learning outcomes.

Research on the effect of gender on learning outcomes shows mixed findings. Some studies, such as those conducted by Hermansyah, Nurhairunnisah, Ardianti, & Sulindra (2023) and Karmila, Surmilasari, & Kuswidyanarko (2022), show that gender can influence learning outcomes, with female students tending to excel more in educational games and learning videos. However, other studies, such as those conducted by Nurdin (2021) and Niqotaini (2021), found no significant effect between gender and learning outcomes, even suggesting that learning technologies such as augmented reality are effective for both genders. In addition, some studies show differences in learning interest between male and female students (Rojabiyah & Setiawan, 2019). However, Winata & Friantini (2020) asserted that men and women have equal potential in improving the quality of learning.

Acceptance of technology and digital learning also shows no major differences based on gender. Today, both male and female students are generally more open and able to utilise technology in the learning process (Chen, Yang, & Hsiao, 2016). This reduces the possibility of differences in the influence of learning media on student learning outcomes. While there are social and cultural factors that may influence how male and female students interact with learning materials, the influence of gender on learning outcomes is more contextual and not strong enough to cause significant differences (Gee, 2015; Ro & Loya, 2015; Yu, 2021). Other factors such as personal ability and the way learning is received determine student learning outcomes more than gender differences themselves.

In addition, interest in learning is basically influenced by many factors other than gender, such as intrinsic motivation, learning environment, support from teachers or parents, and personal experience of each student. Andaya (2014) explains that high student learning outcomes do not see gender status. This is because gender can have the same level of interest in a subject, especially if learning is presented in a way that is interesting and relevant to students (Tanaka, 2023; Yerizon, Wahyuni, & Fauzan, 2021).

Individual factors, such as cognitive ability, learning style, and students' personal effort, also have more influence on learning outcomes than gender itself (Aziz, Mahmud, Mislinawati, & Fitriani, 2022). Thus, while male and female students may have different ways of learning, the end result is not necessarily influenced by gender (Ro & Knight, 2016). Both groups of students have equal potential to absorb the material, especially if the learning methods applied match the students' learning styles and needs.

Conclusion

The results of the inner model test show that the relationship between digital learning media and learning outcomes has a t-statistic of 0.861 and a p-value of 0.389, which is greater than 0.05, indicating that the effect is not significant. Similarly, the relationship between learning interest

and learning outcomes, with a t-statistic of 0.904 and a p-value of 0.366, is also not significant. The results of the multi-group analysis for gender moderation showed that there was no significant difference between genders in moderating the relationship between digital learning media and learning outcomes or learning interest and learning outcomes. The p-values for both relationships for males and females were 0.536 and 0.166 for digital learning media, and 0.212 and 0.514 for learning interest, respectively, all of which were greater than 0.05, indicating that gender did not significantly moderate the relationships.

Suggestions for future research could examine the relationship between students' learning styles and the use of learning media, as well as conduct longitudinal research to assess the long-term effects of digital learning media on learning outcomes. Other factors such as personality, motivation, and age difference can be considered as moderating variables to provide a more comprehensive insight into the effect of learning media on student learning outcomes.

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