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Analysis of the impact of quizizz-based learning, and learning facilities in increasing student learning motivation: integration with SDG.

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Abstract
The low motivation of students to learn in Indonesia is still a major problem in the world of national education. This condition causes a decline in the quality of education, which will ultimately hinder the achievement of Sustainable Development Goal 4 (SDG 4), namely quality and sustainable education. Therefore, this study was conducted to analyze factors that can increase student learning motivation, especially the influence of learning facilities and the use of the Quizizz application in the learning process. This study uses a quantitative approach and Structural Equation Modeling (SEM) analysis. The research sample consisted of 199 students of Muhammadiyah PK Surakarta Junior High School (SMP) who were selected using purposive sampling techniques. The results of this study showed that learning facilities had a significant effect on learning motivation by 47.9% (β:0.479 P-Value 0.002). In addition, the use of the Quizizz application also had a significant effect of 31.1% (β:0.311 P-Value 0.046). Thus, it can be concluded that the learning facilities and the use of the Quizizz application have an influence on students' learning motivation. The combination of the two is needed to increase students' learning motivation optimally, so that the SDG4 goals regarding quality education can be realized.

Keywords:
Quality Education; Quizizz Application; Learning Facilities; SDG4; Learning Motivation

A. INTRODUCTION

Quality education is one of the main pillars in building a society with high intellectual power, and globally competitive (Feraco et al., 2023). This is in line with the *Sustainable Development Goals (SDGs) agenda*, especially SDG 4, which emphasizes the importance of improving the quality of learning (Szőköl, 2022). To realize this, learning motivation is an important factor in helping students achieve their goals (Zen et al., 2022). According to Deci and Ryan in *Self-Determination Theory,* learning motivation is an internal force that encourages individuals to move in a directional way in achieving their goals (Ryan & Deci, 2017). Its role as a driving force to motivate students to be more active and persistent in achieving achievements, both academic and non-academic (Wisudanto et al., 2022). With the high achievements achieved by each student, it results in an increase in the quality of education. Thus, increasing learning motivation is an important indicator in creating quality education (SDGs 4) (Saini et al., 2022).

However, the reality in the field shows that there has been a decline in the level of student motivation nationally. According to UNICEF data in 2021, students in Indonesia experienced an average decrease in motivation in learning by 60% (Abdurrahmansyah et al., 2022). In addition, during the pandemic, 79.4% of ninth-grade students experienced a decrease in learning motivation due to the implementation of *online* learning. Post-pandemic, the decline in student motivation to learn still shows a decline, even though learning has shifted to *an offline* system (Wahyuni & Wati, 2023). The high rate of declining student motivation every year is certainly a serious problem for educational institutions (Gandung, 2024). The emergence of adverse impacts,

such as psychological disorders, poor learning achievement, and so on, adds urgency to the importance of knowing what factors can significantly increase students' motivation to learn (Syakur et al., 2023).

According to the theory of Self-Determination, the learning motivation of each individual is influenced by two main factors, the first is internal factors that come from within the student himself, such as ideals or desires to succeed. Second, external factors, namely factors that affect from the outside, such as the surrounding environment, learning style or method, and so on. In the theory, it is explained that external factors are an important key in the formation of student learning motivation. The psychological aspect of the majority of humans, especially teenagers, always starts learning activities from extrinsic motivation is the reason why extrinsic motivation is the key to increasing student learning motivation. In addition, extrinsic motivation can meet the basic principles of intrinsic motivation formation, such as *autonomy, conpetence, and relatedness*. Thus, external factors become an important factor and an initial foundation in building and increasing students' learning motivation (Ryan & Deci, 2017).

Several previous studies on factors that affect student learning motivation have stated that the use of the Quizizz application in the learning process can have a significant effect on students' motivation (Dreimane, 2021). This is because game-based learning such as Quizizz provides stimulus and new experiences, so that students will be more enthusiastic about the learning process (Mesterjon et al., 2024). However, another study states that the increase in student learning motivation generated by the use of Quizizz is only in small to medium categories (Farhana & Seftianingsih, 2023). In other words, the resulting contribution is relatively small and insignificant.

In addition to the use of Quizizz, there is research that explains that learning facilities have a significant impact on learning motivation (Susanti et al., 2021). The completeness of the facilities of an educational institution results in easy access, and the sense of comfort felt by each student (Adewusi & Oguntokun, 2024). In addition, the habit of individuals in adolescence chooses the school based on existing facilities, causing learning facilities to be an important factor in building students' motivation to learn (Simamora et al., 2023). However, there are studies that show the opposite, where learning facilities do not have a significant effect on students' learning motivation (Akomolafe & Adesua, 2016; Mcgowen, 2007). This means that the contribution of learning facilities to student motivation is only at low to medium levels. In other words, there are still inconsistencies in the impact produced, be it Quizizz or learning facilities on student learning motivation.

This study aims to analyze the impact of the use of Quizizz in the learning process and learning facilities on students' learning motivation, as well as re-examine theories and previous studies using different respondents and places. It is hoped that this research can strengthen the findings of previous research and become a reference for schools, especially in Central Java in developing children's learning motivation, as one of the important factors in the pursuit of quality education (SDG4).

B. METHODS

This study uses a quantitative approach with Structural Equation Modeling (SEM) analysis techniques with the aim of analyzing the relationship between variables, both exsogenous or endogenous variables (Febriandika et al., 2023). SEM analysis was chosen because this analysis method allows researchers to test structural medel in a similar way, thus providing a more complex and comprehensive vilification of the theory developed (Afthanorhan et al., 2020).

The population in this study is all students of Muhammadiyah PK Junior High School Surakarta, Central Java with a total of 370 students. The sampling technique used in this study is Positive sampling, with the following criteria: 1. Have used the Quizizz Application in the learning process for at least 5-6 months, 2. Have been a student at the school for 1 year. these criteria were created so that the respondents in this study were on target and competent (Campbell et al., 2020). The number of final samples used in this study was 199 students. According to Priyanath

et al., (2020) this number of samples meets the minimum sample limit for the SEM analysis test, with a range of 150-200 respondents.

The initial stage of this research begins with a theoretical study sourced from scientific articles with a scopus or national reputation. The results of the theoretical study became the basis for the variables and the preparation of research instruments. The next stage is to write these instruments in the form of questionnaires in Google Forms to be distributed to respondents for one month. The collected data was finally descriptive analysis to see the characteristics of the respondents. Next, the researcher tested the validity and reliability of the data using the Confirmatory Factor Analysis (CFA) and Cronbach's Alpha techniques. This analysis aims to ensure that each item used is able to present variables consistently and accurately, while testing internal stability (Cheung et al., 2024). The Confirmatory Factor Analysis (CFA) test was stated to meet the criteria including a *loading factor* value of ≥ 0.50, a Composite Reliability (CR) value of ≥ 0.70 and an Average Variance Extracted (AVE) value of ≥ 0.50 (Hu & Bentler, 1999; Baharum et al., 2023). Meanwhile, Cronbach's Alpha test is declared reliable if it meets the ≥ value of 0.70 (Govindasamy et al., 2024).

Instruments that are valid and reliable, then the instrument will be tested using *the Goodness of Fit* (GOF) technique to test the model (measurement model) with a minimum limit of χ^2/df < 3.00, GFI > 0.80, CFI > 0.90, TLI > 0.90, and RMSEA < 0.08 (Xiao et al., 2023). The final analysis is hypothesis testing with the aim of testing the relationships between variables. The path coefficient is considered to have a significant effect if it has a P-Value of < 0.05 (Dash & Paul, 2021). The entire series of analyses in this study used SPSS software version 25 and Amos version 24.

C. RESULT & DISCUSSION

In this research, there were 199 students from SMP Muhammadiyah Pk Surakarta who, after conducting a demographic test of respondents, had the following characteristics: there were 69 male students (34.5%) and 130 female students (65.3%), in terms of age, there were 78 students with a range of 12-13 years (39.2%), 117 students with a vulnerable age of 14-15 years (58.8%), 3 students with a vulnerable age of 16-17 years (1.5%) and 1 student with a vulnerable age of 18-19 years (0.5%). In the class category, there were 67 students in grade 7 (33.7%), 64 grade 8 students (32.2%), and 68 grade 9 students (34.2%).

Table 1. Respondent Demographic Results

Characteristic	Category	Frequency	Percentage
Gender	Male	69	34.5
	Female	130	65.3
Age	12-13 years old	78	39.2
	14-15 years old	117	58.8
	16-17 years old	3	1.5
	18-19 years old	1	0.5
Grade	Grade 7	67	33.7
	Grade 8	64	32.2
	Grade 9	68	34.2
	TOTAL	199	100.0

Furthermore, after conducting a demographic test, the researcher conducted a validity and reliability test for each variable using the Confirmatory Factor Analysis (CFA) technique and

Cronbach's Alpha using the Amos.24 software. In the Quizizz Application variable, there are 5 quiz items that represent 5 indicators, including (ease of access, educational games, enjoyment of learning, material delivery media, and evaluation facilities) (Mesterjon et al., 2024; Nadi-Ravandi & Batooli, 2022). Furthermore, in the variable learning facilities, there are 6 questionnaire items representing 4 indicators, including (study rooms, study materials, learning aids, and learning resources) (Patrick et al., 2016). And finally, in learning motivation there are 9 items that represent 5 indicators, including (encouragement, hopes, ideals, learning experiences, interesting activities, conducive environment) (Amabile et al., 1994).

Table 2. Confirmatory Factor Analysis (CFA) and Cronbach's Alpha *test results.*

Variabel	Items	Internal Reliability (Cronbach Alpha)	Factor Loading	AVE	CR
Quizizz App	AQ1	0.840	0.698	0.512	0.839
	AQ2		0.667		
	AQ3		0.616		
	AQ4		0.756		
	AQ5		0.823		
Learning Facilities	FB1	0.858	0.653	0.525	0.867
	FB2		0.715		
	FB3		0.554		
	FB4		0.751		
	FB5		0.828		
	FB6		0.809		
Learning Motivation	MB1	0.895	0.721	0.506	0.902
	MB2		0.826		
	MB3		0.809		
	MB4		0.722		
	MB5		0.692		
	MB6		0.613		
	MB7		0.765		
	MB8		0.614		
	MB9		0.596		

Loading factor ≥ 0,50, Composite Reliability (CR) ≥ 0,70 dan Average Variance Extracted (AVE) ≥ 0,50

The results of the validity and reliability test in **Tabel.2** show a disastrous result. Cronbach's Alpha value in each variable, namely the Quiziz Application 0.840, learning facilities 0.858, and learning motivation 0.895 are above the minimum limit of 0.7 (Govindasamy et al., 2024). This shows that the items possessed by each variable can measure constructs stably and accurately (Hair et al., 2019). In addition, the results of the validity test using *the Confirmatory Factor Analysis* (CFA) technique showed that all *loading factor values* were above the minimum limit of 0.5. The Average Variance Extracted (AVE) value for each variable is in the range of 0.506-0.525, and the Composite Reliability (CR) value is in the range of 0.839-0.902. According to Hu & Bentler, (1999) and Baharum et al., (2023) the AVE value ≥ 0.50 and CR ≥ 0.70 shows that the empirically compiled indicators are able to represent variables validly and consistently.

After the validity and reliability test is carried out, the item that meets the standard is then tested *for Goodness of Fit* (GOF). This test aims to test the validity of the measurement model. The test results are shown in **Table.3** as follows

Table 3. Measurement Model.

GOF Index	Acceptable Value	CFA Model	Result
x^2 (Chi-square)		348.994	Good Fit
Df (degree of freedom)		162	
x^2/df	< 3	2.154	Good Fit
GFI	> 0.8	0.847	Good Fit
CFI	> 0.9	0.915	Good Fit
TLI	> 0.9	0.900	Good Fit
RMSEA	< 0.08	0.076	Good Fit

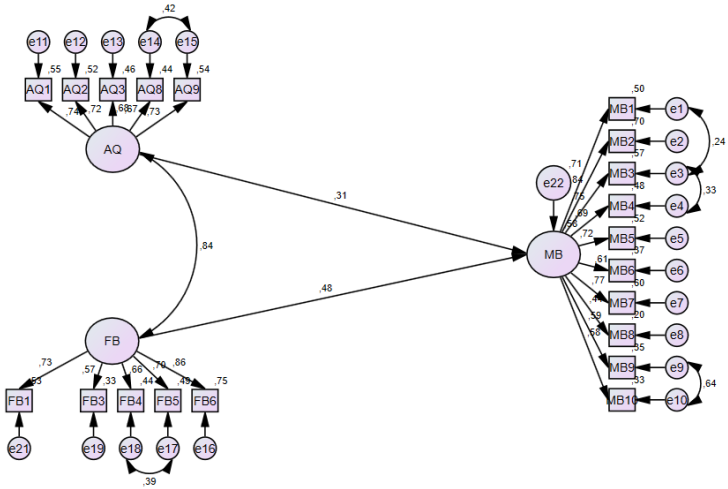

Figure 1. Structural Model.

The results of the Goodness *of Fit* (GOF) analysis using the Amos.24 software show that this research model has met the specified standards. This is because all categories show *goot fit* or accepted results. The x2/DF value < 3.0 is 2.154, the GFI value is > 0.8 which is 0.847, the CFI value is > 0.9 which is 0.915, the TLI value is > 0.9 which is 0.900, and the RMSEA value is < 0.08 which is 0.076. With these results, according to Hu & Bentler, the model made already shows a Good Fit or a good and reliable fit (Dash & Paul, 2021).

Data that have been declared valid and reliable, then the correlation between the variables is tested using the Hypothesis test. The results of the analysis are shown in **Table.4**, as follows:

Table 4. Hypothesis Test Results

Hypothesis	Path	β	S.E.	P-Value	Result
H1	AQ → MB	0.311	0.153	0.042	Supported
H2	FB → MB	0.479	0.141	0.002	Supported

*p<0.05, **p<0.01, ***p<0.001

In **Table.4**, the results of the hypothesis test show that there is a significant impact between the Quizizz Application on learning motivation with a standard coefficient value (β) of 0.311, which means that the influence produced by the Quizizz Application on learning motivation is in the category of moderate influence, which is 31.1%. The second hypothesis shows that there is a

significant impact between learning facilities on learning motivation with a standard coefficient (β) of 0.479, meaning that the influence produced by learning facilities on learning motivation is in the medium category, which is 47.9%.

Analysis of the Impact of the Quizizz Application on Student Learning Motivation

The results of the analysis show that learning based on the Quizizz Application has a significant impact on learning motivation with a standard coefficient (β) of 0.311 and a P-Value value of 0.046. This result indicates that the more intense learning based on the Quizizz Application, the higher the learning motivation possessed by students. Technology-based learning such as the Quizizz Application can generate positive stimuli that can increase student motivation (Derakhshan & Yin, 2024). This result is in line with the research of Zhang & Crawford, (2024) which shows that Quizizz-based learning can significantly increase student motivation.

Learning methods that integrate technology such as the Quizizz Application in the process provide three important points, namely autonomy, competence, and attachment (Guay, 2021). Autonomy refers to the breadth of the individual in regulating the space and rhythm of learning. Competence is related to the student's sense of confidence in his own abilities. And the third is attachment which refers to the high interaction and relationship of students in the learning process. The appearance of these three points in the learning process according to the theory *of Self-Determination* will strengthen students' learning motivation (Muchuweni et al., 2025).

In addition to the emergence of the three dimensions above, Quizizz Application-based learning also according to Zamzami Zainuddin & Perera (2024) presents high student attention (Attention), student satisfaction (Sastisfacion) and student confidence in their abilities. With the emergence of high confidence, and interest in the learning provided, Quizizz App-based learning has succeeded in producing an attractive learning environment that produces stimuli in increasing students' motivation to learn. So it can be concluded that learning based on the Quizizz Application is one recommended option in creating an interesting learning environment that can generate positive stimulus in generating student learning motivation.

Analysis of the Impact of Learning Facilities on Student Learning Motivation

The results of the second analysis showed that learning facilities had a positive and significant impact on students' learning motivation (β = 0.479, p = 0.002). The impact produced by learning facilities is higher than that of the Quizizz Application, which is 47.9%. These results indicate that learning facilities such as adequate and complete classrooms, modern learning media will have an impact on students' learning motivation which is intended for the emergence of enthusiasm. According to Balqis et al., (2023) adequate facilities and complete infrastructure will make it easier for students in the learning process. The sense of ease generated by the facilities makes students feel excited, so that the motivation to study harder will appear more.

This result is in line with Zajda's (2024) research which explains that well-made and complete rooms, modern learning media and tools can increase students' motivation to learn. In addition, according to the *theory of ecology,* ebrajar facilities are external factors that play an important role in the formation of individual motivation. A sense of appreciation and a sense of comfort is one of the things that arise from adequate learning facilities. (Hardiansyah & Rasia, 2022). The Achievement Motivation Theory also explains the same thing. According to him, every individual will develop when the surrounding environment is supportive, such as complete facilities, modern media and tools, or conducive environmental conditions (Cayubit, 2022). The high intensity of students with learning facilities also makes students' learning motivation highly dependent on learning motivation. poor and inadequate facilities make students lazy to learn due to the difficulty of access and the learning process itself (Hussain & Afzal, 2023; Ibrahim & Aslam, 2025). Thus, learning facilities not only play a role as a technical support for learning, but also act as a form of student motivation in learning.

D. CONCLUSION

Based on the results of the research, it can be concluded that both the Quizizz Application and the learning facilities, each have a significant impact on student learning motivation. The use of Quizizz in the learning process provides a new atmosphere, interactive learning style and supports aspects that build motivation, such as *autonomy, competence,* and *relatednees*, so that it has a significant influence. However, this study found that the impact produced by learning facilities on student learning motivation is much higher than that of Quizizz. Equipped facilities, comfortable classrooms, and modern learning media have proven to be more effective in fostering enthusiasm, comfort, and a sense of appreciation that have an impact on increasing student motivation.

Theoretically, the findings of this study strengthen and expand the theory of *Self-Determination* and the Theory of Motivation for Achievement, and the findings of previous research that state that there is a significant influence on each variable. Practically, for schools, both teachers and principals, increasing motivation is not only limited to learning methods or the use of technology, but also to the provision of facilities, both physical and non-physical, that are good and adequate. With its influence on learning motivation, this study supports the formulation of SDG4 regarding quality education, because it shows that the quality of education can be influenced by technology and scarce educational facilities.

This study still has limitations in the scope of the sample which is still limited to one school, as well as variables that still focus on extrinsic aspects. Therefore, further research is needed by including intrinsic variables, such as Internal Goal Orientation, Learning Mindset, and others. In addition, increasing the scope of the research sample is important so that it can be more representative of the existing population, so that the factors that form learning motivation can be identified more comprehensively.

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