The Influence of the Problem Based Learning Model Combined with 5E Assisted by Quizizz as Media Assessment on Higher Order Thinking Skills (HOTS)

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Abstract. Efforts to improve HOTS as a whole as part of dealing with situations and adaptation in developments in various sectors, today are very important skills for students because they are basic concepts of thinking that are able to form complete and complex knowledge. For this reason, the development of HOTS in the learning process in basic education to higher education is important to be developed. In this study, researchers will examine how the influence and improvement of HOTS when learning is carried out using the PBL model combined with 5E Assisted by Quizizz as media assessment. The research method used is an experimental research method by dividing two research classes, namely the experimental class and the control class as a comparison class. The results of the research that were processed using the SPSS application showed that the significance value for procedural HOTS was 17.370, conceptual HOTS was 11.656 and metacognitive HOTS was 11.656. These results show that the effective use of the PBL Model Combined With 5E Assisted by Quizizz as Media Assessment can improve HOTS at the procedural HOTS, conceptual HOTS and metacognitive HOTS levels.

Keywords: Problem Based Learning · 5E Cycle · Quizizz · HOTS

1 Introduction

The very rapid changes in various activities which are the impact of the rapid development of technology require very fast anticipation, revitalization and adaptation. Likewise in the world of education, educational institutions need to prepare graduates who are able to think comprehensively and quickly anticipate changes. In order for individuals to compete, individuals must have complex and comprehensive thinking skills which are then combined with good collaboration skills as part of a team both in the work environment and outside of work. This article describes how learning activities should be able to lead to the improvement of complex skills by increasing HOTS as part of increasing life achievement in the 21st century through education. This idea is in line with the theme of the PICEEBA conference, namely "Leap to the imminent future: Seizing Opportunities in Education, Economics, and Business".

The high global competition that occurs in the 21st century requires every individual to be able to master various skills as a whole. According to [1]. In order for individuals to be able to adapt and compete in the 21st century, individuals must have critical thinking skills, creative thinking, and problem solving. To form these skills, the role of education becomes very important because the development process can be carried out directly in the learning environment. This will then directly contribute to the growth of community readiness to face global challenges. [1] explained that these skills will appear in students if in learning activities, educators are able to integrate HOTS simultaneously. For this reason, directing learning to HOTS is currently very important [2]. However, related to HOTS, experts have different points of view in defining HOTS. [3] states: "Higher-order thinking occurs when a person takes new information and information stored in memory and interrelates and/or rearranges and extends this information to achieve a purpose or find possible answers in perplexing situations". From this opinion, it can be concluded that HOTS will be formed when individuals are able to compile new information obtained and then elaborated on the knowledge that has been obtained previously. The process certainly requires a complex and thorough thought process so that the knowledge gained can be well organized in order to form a whole new knowledge.

The results of PISA observations (2015) state that the cause of the low level of HOTS of students in Indonesia is due to the low level of learning developed in Indonesia. A report from the World Bank on student achievement in primary and secondary schools also shows that the level of learning achievement in Indonesia is still low although it continues to increase over time [4]. In line with this, the research from [5] mentions that in general the learning patterns developed in Indonesia are still focused on developing low-level abilities, even though to face the challenges of learning so rapidly, students are currently required to be able to develop HOTS. The results of other studies state that currently, learning in schools is still dominated by conventional learning patterns [6–12]. This lower level of HOTS also occurs in students of Economics Education, Pasundan University. From 38 students who were tested for HOTS, only 14 students were able to demonstrate HOTS. As many as 24 other students have not been able to show good performance on the higher order thinking ability test. This can be seen in Table 1.

Table 1. Distribution of the Number of Students in the Pre-Test of HOTS Ability

No	The Cognitive Process	The Knowledge Dimension			
		Fact-ual	Conce-ptual	Proce-dural	Meta-cognitive
1	Remembering	38	30	32	24
2	Understanding	31	32	24	20
3	Applying	25	28	16	15
4	Analyzing	12	11	10	5
5	Evaluating	13	12	13	9
6	Creating	8	5	5	2

Source: Initial HOTS Test for Unpas Economic Education Students

For this reason, efforts to create and improve human resources who have high compe-
tence in various aspects of national and state life through education are the professional
duties of an educator. So that it is not enough for educators to deliver teaching materials
in class by relying on textbooks, because basically learning is actually broader than that.
Learning can be obtained not only in the classroom or in books, but must also be adopted
from the school environment to the wider community. Learning must also be pursued
and adapted to what is currently needed by the respective professional world. For this
reason, HOTS must be part of the curriculum in combination with other required skills
[6, 9, 13, 14]. Maybe this has something to do with what was stated by [15] that nowa-
days people tend to still think HOTS is not something important that must be taught in
schools.

The government's seriousness in developing Indonesian education, especially in
improving HOTS. The government's seriousness is in line with the fact that based on
the UNDP version of the Human Development Report 2020, the quality ranking of
Indonesian Human Resources or the Human Development Index (HDI) is still at 111
out of 185 countries in the world. In line with this, Program for International Student
Assessment (PISA) report stated in 2015 that Indonesia was ranked 62 out of 74 countries.
Furthermore, the PISA report states that 15-year-olds in Indonesia are not even able to
"use the knowledge base to identify valid scientific conclusions from simple data sets".
In mathematics, two-thirds of students in Indonesia are still unable to construct relevant
information from one source and make literal interpretations where the results have
barely changed since 2006. In addition, an insignificant increase was also seen in the
literacy skills of students from 2019 onwards. in 2015 where the increase was only
3% from 53% to 55%. Moreover, in 2015, more than half of 15-year-old Indonesians
surveyed were unable to "recognize main ideas in texts, understand relationships, or
interpret meaning in texts when the information is not prominent" [16]. Referring to the
Pisani report (2016), the development of HOTS is still very possible in Indonesia. From
72 countries surveyed, students in Indonesia perceive science as a critical and interactive
process.

From the data presented by PISA in 2015, it appears that students in Indonesia are
quite competitive with countries in Asean. These results provide hope that the HOTS
skills of students in Indonesia basically have great potential to be improved. Therefore,
educators must be able to ensure that the learning process in the classroom is able to
direct students to HOTS [17] (Fig. 1).

In this regard, [18] argues that HOTS can be improved through social modeling,
reinforcement, and classroom atmosphere. Another opinion reveals that higher order
thinking can also be improved by adopting certain domains in which an individual
works and is active [19]. For that, [20] explained that in the learning process that leads
to high-level abilities there must be an interaction between the learning method and
the learning process that requires students to think complexly. According [21] there are
three learning models that can direct students to complex thinking processes that lead to
an increase in students' HOTS, namely Discovery Learning, Problem Based Learning,
and Project based learning. Meanwhile, according to [22]. There are 3 models that can
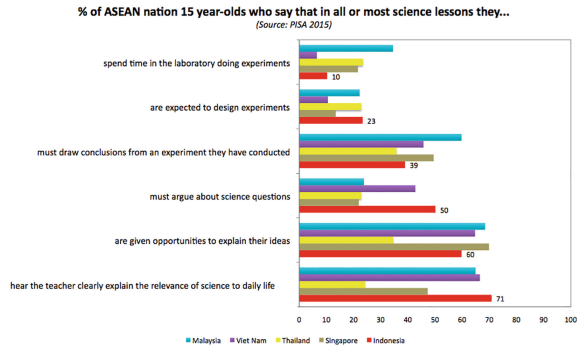be used to develop HOTS, namely experiment, fault-finding and mini-project design.

Fig. 1. Percentage of ASEAN nation 15 Year Olds who say in All or most science lessons

Furthermore, [22] explained that all three were able to significantly improve students' HOTS.

In addition, in an effort to improve HOTS, this learning model needs to be supported by learning media using technology. Referring to the research results [23–27] that the use of technology media as part of learning can improve HOTS thinking skills. [28] explained that "there are three basic principles in educational technology as a reference in its development and utilization, namely: a systems approach, student oriented, and the use of learning resources". More briefly, Martin in [28] stated that there is a close relationship between Information and Communication Technology, information technology is more on information processing systems while communication technology functions for information delivery. To support this process, the researcher took the quizizz assessment media as part of implementing technology into teaching and learning activities. The selection of quizizz assessment media is based on research results [5, 29–31] which generally reveals that quizizz-assisted learning is able to increase students' learning activities and interest in class. Quizizz is an online application that helps students check their knowledge and progress in learning [31].

Based on the explanation presented above, the researcher sees the need for research related to how the learning process uses the PBL model combined with 5E Assisted by Quizizz as media assessment in improving HOTS at the conceptual, procedural and metacognitive cognitive levels.

2   Methodology

The purpose of this study was to examine the effect of the PBL model combined with 5E Assisted by Quizizz as media assessment on students' HOTS. Bryman & Bell (2015) divides the research approach into three types, namely the deductive research approach, the inductive research approach and the abductive research approach. More Bryman & Bell (2015) explained that the deductive approach is a research approach that tests the validity of assumptions (theories/hypotheses), while the inductive approach contributes to the emergence of new theories and generalizations. On the other hand, abductive research begins with 'surprising facts' or 'riddles' and the research process reveals

Table 2. Research Subjects

Group	Pre-test	Treatment	Post-test
A	O_1	X	O_2
B	O_3	–	O_4

Table 3. Research Subjects

Class	Description	Number of Students
Class A	PBL model combined with 5E Assisted by Quizizz as media assessment.	34
Class B	PBL model	34
	Total	**68**

explanations for these events. On the basis of this explanation, in this research the author uses an inductive research approach with a quasi-experimental research method. The quasi-experimental method (quasi-experimental) is an experiment conducted with intact group subjects (intact group) and not subjects taken at random to be given treatment.

While the research design used is Non-equivalent control group design with the following design (Table 2).

Explanation:

A = Experiment Group

B = Control Group

$O_{1,3}$ = Pretest

$O_{2,4}$ = Postest

X = PBL model combined with 5E Assisted by Quizizz as media assessment

The subjects in this study were students of the 2019 Pasundan University Economic Education Study Program Class A and B totaling 70 studentsFor more details, the researchers present the research subjects in the form of Table 3.

3   Result and Finding

3.1   Difference Test and Analysis of N-Gain HOTS Conceptual

Based on the results of the N-Gain analysis on the three models, it shows that the learning model in the third experiment, namely the PBL model combined with 5E Assisted by Quizizz as media assessment, shows a higher level of effectiveness than the other two models where the model obtains an N-Gain score of 0.501 with a variance 0.017. From the observations of researchers during the implementation of the research, the PBL learning model combined with the 5E learning cycle assisted by the Quizizz learning media has an impact on learning activities in the form of increasing learning activities. Students become more active in learning and contribute to learning activities in the form

Table 4. HOTS N-Gain Score on Each Learning Model

Analyze	N-Gain Konseptual		
	PBL 5E *Quizizz*	PBL 5E	PBL
N	34	34	34
Mean	0,501	0,461	0,322
Variance	0,017	0,015	0,361
Std. Deviation	0,131	0,123	0,039
Minimum	0,30	0,30	−0,57
Maximum	0,89	0,77	0,62

of expressing opinions, asking questions and refuting the opinions of other students (Table 4).

This is what the researchers suspect is able to improve the ability of students' HOTS. In the implementation of learning, students are required to be able to describe problems, analyze, find solutions to make decisions. This series of activities simultaneously gives students the ability to maximize their potential to construct learning. This process also shows that during the learning process, there has been an interaction between the learning model and the learning process that leads to complex thinking processes.

3.2 Difference Test and Analysis of N-Gain HOTS Procedural

Based on the N-Gain analysis on the three models, it was found that the learning model in the third experiment, namely the PBL model combined with 5E Assisted by Quizizz as media assessment, showed a higher level of effectiveness compared to the other two models where the model obtained an N-Gain score of 0.508 with variance of 0.012, this result can be interpreted that the PBL model combined with the 5E learning cycle assisted by the Quizizz learning media is statistically more effective than the PBL model combined with the 5E learning cycle and the PBL model. While the N-Gain with the lowest average was achieved by students in the PBL learning model category with a score of 0.429 with a variance of 0.018, this result can be interpreted that the PBL learning model is statistically less effective than the PBL model combined with the 5E learning cycle and the PBL model combined with the PBL model combined with 5E Assisted by Quizizz as media assessment. This indicates that the combination of the PBL model with the 5E learning cycle with quizizz media has a high influence interaction in the development of student activities in the learning process, through the combination of PBL model combined with 5E Assisted by Quizizz as media assessment students can increase learning activities because the combination has a stimulus higher level to stimulate students to express their potential in the context of learning (Table 5).

3.3 Difference Test and Analysis of N-Gain HOTS Metacognitive

Based on the results of the N-Gain analysis on the three models, it shows that the learning model in the third experiment, namely the PBL model combined with 5E Assisted by

Table 5. HOTS N-Gain Score on Each Learning Model

Analyze	N-Gain HOTS Prosedural		
	PBL 5E *Quizizz*	PBL *5E*	PBL
N	34	34	34
Mean	0,508	0,474	0,429
Variance	0,012	0,011	0,018
Std. Deviation	0,108	0,104	0,133
Minimum	0,33	0,33	0,26
Maximum	0,81	0,72	0,87

Quizizz as media assessment, shows a higher level of effectiveness than the other two models where the model obtains an N-Gain score of 0.472 with a variance of 0.010., this result can be interpreted that the PBL model combined with 5E Assisted by Quizizz as media assessment is statistically more effective than the PBL model combined with the 5E learning cycle and the PBL model. While the N-Gain with the lowest average was achieved by students in the PBL learning model category with a score of 0.330 with a variance of 0.007, this result can be interpreted that the PBL learning model is statistically less effective than the PBL model combined with the 5E learning cycle and the PBL model combined with the PBL learning cycle. 5E learning assisted by quizizz learning media. Judging from the data, the researcher can state that the combination of the PBL model with the 5E learning cycle with quizzz media is considered an effective combination in answering problems in developing HOTS skills in students (Table 6).

Table 6. HOTS N-Gain Score on Each Learning Model

Analyze	N-Gain HOTS Prosedural		
	PBL 5E *Quizizz*	PBL *5E*	PBL
N	34	34	34
Mean	0,472	0,441	0,330
Variance	0,010	0,009	0,007
Std. Deviation	0,097	0,091	0,083
Minimum	0,31	0,31	0,05
Maximum	0,74	0,67	0,50

3.4 The Influence of the PBL Model Combined with 5E Assisted by Quizizz as Media Assessment on HOTS Conceptual Level

Based on the results of research conducted by researchers, it can be described that the effect of the PBL model combined with 5E Assisted by Quizizz as media assessment in improving HOTS at the conceptual cognitive level can be described as follows:

Testing of the proposed hypothesis uses the Two Ways Anova test. Hypothesis testing will be carried out on the null hypothesis (Ho) with the test criteria if the significance value is less than 0.05, it means that the null hypothesis is not accepted (rejected) and the alternative hypothesis is accepted. Conversely, if the significance value is greater than 0.05, it means that the null hypothesis is accepted and the alternative hypothesis does not exist or is rejected. Meanwhile, the results tests of between-subjects effect the learning model for the conceptual HOTS is presented in Table 7.

Based on the analysis of the data presented in the table, it can be seen that the significance score is 0.000 which is smaller than 0.05 so that it can be stated there is the influence of the learning model that uses PBL model combined with 5E Assisted by Quizizz as media assessment on HOTS conceptual.This can be seen from the F value of 17,370.

So it can be concluded that Ho is unacceptable (rejected) which means Ha can be used or accepted. The amount of the contribution given can be seen in the R square score obtained, which is 0.260. This means that the amount of contribution given by the learning model variable to the conceptual HOTS variable is 0.260 or 26%. To prove that there is an effect of the learning model on conceptual HOTS, it can be proven by the acquisition based on the existence of mean difference Conceptual HOTS ($\mu A1 \neq$ and $\neq \mu A3$). The results of the calculation of the mean in each model (PBL, and PBL 5E quizizz) on the conceptual HOTS were calculated using the SPSS version 24 application which is presented in Table 8.

Based on the analysis of the data presented in the table, the average ability of student conceptual HOTS using the model PBL model combined with 5E Assisted by Quizizz as media assessment of 81.3235, while the average Student conceptual HOTS using the model problem based learning amounted to 69.1765. Based on the class mean scores,

Table 7. Tests of Between-Subjects Effects of Learning Models on Conceptual HOTS

Dependent Variable: HOTS_CONCEPTUAL

Source	Type III Sum of Squares	df	*Mean Square*	*F*	Sig.
Corrected Model	2648,373[a]	2	1324,186	17,370	,000
Intercept	590368,628	1	590368,628	7744.335	,000
MODEL	2648,373	2	1324,186	17,370	,000
Error	7547,000	99	76,232		
Total	600564,000	68			
Corrected Total	10195,373	101			

[a]R Squared =,260 (Adjusted R Squared =,245)

Table 8. Descriptive Statistics Learning Model in Conceptual HOTS

Dependent Variable: HOTS_CONCPEPTUAL

MODEL	*mean*	Std. Deviation	N
PBL 5E Quizizz	81.3235	9.11782	34
PBL	69.1765	7,22148	34
Total	150.5000	16.3393	68

which are statistically shown, the mean is different. There is a difference in the mean in each learning model, proving that there is an effect of using the model in each experimental class, both in the experimental class using the PBL model, and PBL model combined with 5E Assisted by Quizizz as media assessment on HOTS conceptual.

PBL model combined with 5E Assisted by Quizizz as media assessment. The results of statistical tests showed that there were differences in learning outcomes data before and after using PBL with quizizz-assisted 5E. This shows that students' HOTS skills are influenced by the model used in the learning process. This is relevant to the research results [23–27] which states that the use of technology media as part of learning can improve HOTS. Judging from the data, the researcher can state that the combination of the PBL model with the 5E learning cycle with quizizz media is considered an effective combination in answering problems in developing HOTS skills in students as the results of research reveal that "the problems that exist in the world of education today are a process of Thinking or more specifically metacognitive processes are often not considered in the mathematics learning process, including when preparing lesson plans and when compiling evaluation instruments.

Regarding quizizz as a media evaluation in measuring the achievement of students in learning, it is also a very positive thing to use during the learning process. The existence of this media supports students to be more active and enthusiastic during the learning process. This opinion is also in line with the results of research conducted by [5, 30–32]. Where, all the results of these studies state that in general learning with quizzes is able to increase students' learning activities and interest in class. However, researchers also realize that the use of this quiz media is a small part of the use of technology media in the learning process. So that educators are expected to be able to develop and formulate the optimal use of technology media in the learning process, the authors believe the results will be much better. This is relevant to the results of research [23–25, 33, 34] which states that the use of technology media as part of learning can improve HOTS.

PBL encourages students to know how to learn and work together in groups to find solutions to problems in life. The application of PBL arises from the concept that students will be better able to explore their thinking abilities. The role of educators in this process is to provide feedback to students to work together to find or apply their own ideas in analyzing and solving a problem. Problem based learning (PBL) learning model which is the focus of research conducted by researchers is expected to be an alternative solution to the problem of improving thinking skills for students of the Economics Education Study Program, FKIP Pasundan University.

3.5 The Influence of the PBL Model Combined with 5E Assisted by Quizizz as Media Assessment on HOTS Procedural Level

Then based on the results of research conducted by researchers, it can be described that the effect of the PBL model combined with 5E Assisted by Quizizz as media assessment in improving HOTS at the procedural cognitive level can be described as follows:

Testing of the proposed hypothesis uses the Two Ways Anova test with a Three-Factor Between-Subject design. Hypothesis testing will be carried out on the null hypothesis (Ho) with the test criteria if the significance value is less than 0.05, it means that the null hypothesis is not accepted (rejected) and the alternative hypothesis is accepted. Conversely, if the significance value is greater than 0.05, it means that the null hypothesis is accepted and the alternative hypothesis does not exist or is rejected. Meanwhile, the results *tests of between-subjects effects* The learning model for procedural HOTS is presented in Table 9.

Based on the analysis of the data presented in the table, it can be seen that the significance score is 0.000 which is smaller than 0.05 so that it can be stated there is influence PBL model, PBL model combined with 5E learning cycle and PBL model combined with 5E Assisted by Quizizz as media assessment to HOTS procedural. This can be seen from the F value of 11,656. So it can be concluded that Ho is unacceptable (rejected) which means Ha can be used or accepted. The results of this analysis are in line with the previous analysis (One-ways ANOVA test) which means that statistically there is a difference*HOTS* procedural students who use PBL model, and PBL model combined with 5E Assisted by Quizizz as media assessment.The amount of the contribution given can be seen in the R square score obtained, which is 0.191. This means that the amount of contribution given by the learning model variable to the procedural HOTS variable is 0.191 or 19.1%. To prove that there is an effect of the learning model on procedural HOTS, it can be proven by the acquisition based on the presence of mean difference procedural HOTS ($\mu A1 \neq$ and $\neq \mu A3$). The results of the calculation of the mean in each model (PBL, and PBL 5E quizizz) on the procedural HOTS were calculated using the SPSS version 24 application which is presented in Table 10.

Table 9. Tests of Between-Subjects Effects of Learning Models on Procedural HOTS

Dependent Variable: HOTS_PROCEDURAL

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2019,059[a]	2	1009.529	11,656	,000
Intercept	551911,853	1	551911,853	6372,605	,000
MODEL	2019,059	2	1009.529	11,656	,000
Error	8574,088	99	86.607		
Total	562505,000	68			
Corrected Total	10593.147	101			

[a]R Squared =,191 (Adjusted R Squared =,174)

Table 10. *Descriptive Statistics*Learning Model in Procedural HOTS

Dependent Variable: HOTS_PROCEDURAL

MODEL	mean	Std. Deviation	N
PBL_QUIZIZZ	74.7353	9.66502	34
PBL	67.6176	9.12544	34
Total	142.3529	18,79046	68

Based on the analysis of the data presented in the table, it is obtained that r The average conceptual HOTS ability of students using PBL model combined with 5E Assisted by Quizizz as media assessment is 74.7353, while the average procedural HOTS of students using problem based learning models is 67.6176.

Based on the mean scores of the three classes which were shown statistically, they did show different means. There is a difference in the mean of each learning model, proving that there is an effect of using the model in each experimental class, both in the experimental class using the PBL model, PBL combined with the 5E learning cycle and PBL model combined with 5E Assisted by Quizizz as media assessment on HOTS Procedural Thinking Skills.

3.6   The Influence of the PBL Model Combined with 5E Assisted by Quizizz as Media Assessment on HOTS Metacognitive Level

Testing of the proposed hypothesis uses the Two Ways Anova test with a Three-Factor Between-Subject design. Hypothesis testing will be carried out on the null hypothesis (Ho) with the test criteria if the significance value is less than 0.05, it means that the null hypothesis is not accepted (rejected) and the alternative hypothesis is accepted. Conversely, if the significance value is greater than 0.05, it means that the null hypothesis is accepted and the alternative hypothesis does not exist or is rejected. Meanwhile, the results of *tests of between-subjects effect* the learning model for metacognitive HOTS is presented in Table 11.

Based on the analysis of the data analysis presented in Table 11 it can be seen that the significance score is 0.000 which is smaller than 0.05 so that it can be stated there is influence PBL model, and PBL model combined with 5E Assisted by Quizizz as media assessment against HOTS metacognitive. This can be seen from the F value of 24,089. So it can be concluded that Ho is unacceptable (rejected) which means Ha can be used or accepted.

The results of this analysis are in line with the previous analysis (One-ways ANOVA test) which means that statistically there is a difference *HOTS* metacognitive students who use PBL model combined with 5E Assisted by Quizizz as media assessment.The amount of the contribution given can be seen in the R square score obtained, which is 0.327. This means that the amount of contribution given by the learning model variable to the HOTS variable metacognitive of 0.327 or 32.7%.

To prove that there is an effect of the learning model on metacognitive HOTS, it can be proven by the acquisition based on the presence of mean difference metacognitive

Table 11. Tests of Between-Subjects Effects of Learning Models on Metacognitive HOTS

Dependent Variable: HOTS_METACOGNITIVE

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3371,843	2	1685,922	24,089	,000
Intercept	508376,480	1	508376,480	7263,908	,000
MODEL	3371,843	2	1685,922	24,089	,000
Error	6928,676	99	69.987		
Total	518677,000	70			
Corrected Total	10300,520	101			

[a]R Squared =,327 (Adjusted R Squared =,314)

HOTS (μA1 $\neq$ and $\neq \mu$A3). The results of the calculation of the mean in each model (PBL, and PBL 5E quizizz) on metacognitive HOTS were calculated using the SPSS version 24 application which is presented in Table 12.

Based on the analysis of the data presented in the table, it is obtained that r average ability HOTS metacognitive students who use the PBL model combined with 5E Assisted by Quizizz as media assessment is 72.7353, while the average HOTS metacognitive students who use the problem based learning model is 62.7353. Based on the class mean score indicated by statistics do show different means.

So that learning that leads to problem-solving skills is one of the right strategies to improve students' HOTS. This opinion is also in line with the results of research conducted by [5, 29–31]. Where, all the research results show that in general, quizizz-assisted learning is able to increase students' learning activities and interest in class. However, the researcher also realizes that the use of quizizz assessment media is a small part of the use of technology media in the learning process.

Though metacognitive has an important role in learning [35]. Therefore, this combination of models should continue to be implemented and improved in the learning process so that it has a significant influence on metacognitive skills. A theory reveals that "Metacognitive skills are important for students, because these abilities are related to strategies for how a person learns or learning how to learn and thinking about thinking" [36]. In line with this, another opinion revealed that "Metacognitive abilities can help improve student learning performance, make students learn more independently

Table 12. *Descriptive Statistics*Learning model

Dependent Variable: HOTS_METACOGNITIVE

MODEL	mean	Std. Deviation	N
PBL_QUIZIZZ	72.7353	9.66502	34
PBL	62.7353	5.78037	34
Total	135.4706	15,44539	68

and be responsible for their own learning processes and outcomes" [37]. In the other hand, [38] also stated that the use of the PBL model is very supportive when used to develop students' creativity. For this reason, problem-based learning to develop higher-order thinking is very important as part of the actualization of students, the formation of logical thinking to improve the quality of life in the future [39].

4   Conclusion

Based on the results of the research findings and discussion presented above, it can be seen that the use of the PBL model combined with 5E Assisted by Quizizz as media assessment in improving HOTS at conceptual, procedural and metacognitive cognitive levels.

First, at the conceptual cognitive level, it is stated that there is an influence of the learning model using the PBL model, and the PBL model combined with 5E Assisted by Quizizz as media assessment on the conceptual HOTS. This can be seen from the F value of 17.370. So, it can be concluded that Ho is unacceptable (rejected) which means Ha can be used or accepted. The amount of the contribution given can be seen in the R square score obtained, which is 0.260. This means that the amount of contribution given by the learning model variable to the conceptual HOTS variable is 0.260 or 26%.

Secondly, at the procedural level, it can be stated that there is an effect of the PBL model, the PBL model is combined with the 5E learning cycle and the PBL model combined with 5E Assisted by Quizizz as media assessment on the procedural HOTS. This can be seen from the F value of 11,656. So it can be concluded that Ho is unacceptable (rejected) which means Ha can be used or accepted. The results of this analysis are in line with the previous analysis (One-ways ANOVA test) which means that statistically there are differences in the procedural HOTS of students who use the PBL model, and the PBL model combined with 5E Assisted by Quizizz as media assessment. The amount of the contribution given can be seen in the R square score obtained, which is 0.191.

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