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Student Worksheets and the Level of Students' Confidence in Solving the HOT Questions

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Abstract

This research aimed to determine whether the group student worksheets method was more effective than the individual student worksheets method in solving questions and whether there was an interaction between the method and the level of student confidence in solving HOTS questions among students. This type of research was experimental research by using a 3x2 factorial treatment design. Liliefors' statistics was used to test normality and Levene's test for homogeneity of variance. All these analyses used the SPSS version 22 program. The results showed the group student worksheets method was more effective than conventional and individual methods in solving the HOTS questions. There was an interaction between the method and the level of confidence in solving HOTS questions which was acceptable. The conclusion is that student worksheets in solving HOTS questions can increase the effectiveness of the self-confidence level of students.

Keywords
Effectiveness, student worksheets, self-confidence, HOTS questions

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Introduction

In the era of globalization, where digital literacy is a very abundant flow of information, students need to have the ability to select relevant sources and information, find quality learning resources, and assess sources from the aspects of objectivity, reliability, and up-to-datedness (Purba et al., 2022). Factors influencing literacy skills, critical thinking skills, and students' success in learning mathematics are generally grouped into factors from outside and within the students themselves. Several factors within students that can influence students' abilities and success in learning include students' learning motivation and self-confidence (Purba et al., 2022). A paramount component to achieving this goal is building literacy education (Van den Akker et al., 2006). Numeracy literacy is a person's ability to use reasoning (Ismafitri et al., 2022). Numeracy literacy is part of mathematics. Thus, the components of implementing numeracy literacy cannot be separated from the material covered in mathematics. Mathematics is a science related to exact knowledge that has been systematically organized, including rules, ideas, logical reasoning, and logical structures (Agustihana & Suparno, 2019; Ismafitri et al., 2022).

The low quality of education in Indonesia includes mathematics education. Mathematical abilities are needed to cognitively help students to be able to think logically. TIMSS (Trends in International Mathematics and Science Study) is a cross-country study carried out by the IEA (International Association for the Evaluation of Educational Achievement) every four years (Mandini & Hartono, 2018). Based on TIMSS results in 2011, the mathematical reasoning ability of class VIII students in Indonesia was still below the international average, which was only 17% answered correctly, while the international average was 30% (Hiebert et al., 2005). The quality of mathematics education in Indonesia, which is still low, was also expressed by Widodo (2016). Mandini and Hartono (2018) also showed that Indonesian students' achievement in mathematics was still low, especially regarding Higher-Order Thinking Skills (HOTS) questions.

The ability to understand mathematical concepts is one of the mathematical skills or proficiency that is expected to be achieved in learning mathematics, which is by demonstrating an understanding of mathematical concepts that can interpret, classify, explain, formulate, and calculate material in a flexible, accurate, efficient, and precise manner (Destiniar et al., 2019). Students' difficulty in understanding the material is the primary cause of low learning outcomes and the school conditions about the results (Siahaan et al., 2022). Apart from the ability to understand mathematical concepts, which are included in cognitive abilities, students' affective abilities must also be developed. One of the examples is self-efficacy or self-confidence. In addition, self-efficacy is a belief that students must have to be successful in the learning process (Destiniar et al., 2019).

Based on the results of observations and interviews with mathematics teachers at SMA Negeri 7 Denpasar, the difficulties experienced by students when working on student worksheets were not based on HOTS questions, where students did not know how to formulate problems. Therefore, there is a need for innovation in learning through the development of teaching materials, such as the development of student worksheets based on HOTS questions, which are designed to be as attractive as possible. So far, student worksheets designs are still unattractive because it is hard to create student worksheets that emphasize the

information processing process and require students to a high analytical skill (Noviati et al., 2022). Developing teaching materials in the form of student worksheets is hoped to be a solution to improving critical thinking and mathematics learning outcomes in schools.

Critical thinking is the ability to carry out analysis, create and use criteria objectively, and evaluate data (Wicaksono & Prihatnani, 2019). Mathematical critical thinking is the ability to solve problems, analyze, evaluate, and compare things with good reasons to make the best decisions in solving mathematical problems (Wicaksono & Prihatnani, 2019). One of the factors that can influence students' mathematical critical thinking skills is self-confidence. Tresnawati, Hidayat, and Rohaeti (2017) concluded that the percentage of a person's critical mathematical thinking ability influenced by self-confidence was 74.6%. Meanwhile, 25.4% were influenced by other factors outside of self-confidence (Wicaksono & Prihatnani, 2019). This critical and creative thinking pattern can be achieved when someone has high-level thinking abilities, called HOTS. Regarding this, students at all levels of education need to be equipped with HOTS, so they can prepare themselves to face all the challenges in the 21st century. Additionally, Simanjuntak et al. (2020) explained that the ability to think critically is crucial to improving the quality of survival in this 21st century. HOTS questions are a measurement instrument used to measure high-level thinking abilities, namely thinking abilities that do not just remember (recall), restate, or refer without processing (recite) (Widana, 2017). The main aim of HOTS questions is to improve students' thinking abilities at a higher level, especially those related to the ability to think critically in receiving various types of information, think creatively in solving problems using their knowledge, and make decisions in situations. complex (Ismafitri et al., 2022). HOTS also asks students to critically evaluate information, draw conclusions, and make generalizations (Sukendra & Fridayanthi, 2020). The characteristics of HOTS according to the Ministry of Education and Culture (2017) are measuring high-level thinking abilities, minimizing aspects of memory or knowledge, based on contextual problems, attractive stimuli, and not routine. High-level thinking abilities in the revised Bloom's Taxonomy involving analysis (C4), evaluating (C5), and creating (C6) are considered high-level thinking. Indicators for measuring high-level thinking abilities include analyzing, evaluating, and creating (Sukendra, 2020). In general, HOTS questions measure metacognitive dimensions, not just factual, conceptual, or procedural dimensions (Atmaja et al., 2021). The metacognitive dimension describes the ability to connect several different concepts, interpret, solve problems, choose problem-solving strategies, and discover (Widana, 2017).

The Ministry of National Education (2008) explained that student worksheets are a medium used by teachers to be more organized and make students more active in learning (Salwan & Rahmatan, 2018). Worksheets can increase students' interest in writing and build unity in group learning (Salwan & Rahmatan, 2018). The function of using student worksheets is to increase student activity and optimize understanding of concepts, train students' skills, be a guide in learning activities, and help students apply the concepts that have been discovered (Siahaan et al., 2022). Student worksheets are a sheet containing activities that can foster students' curiosity, high-level thinking abilities, and skills (Nadifatinisa & Sari, 2021). In designing worksheets well, you need to pay attention to language writing rules and relevant questions that can motivate students to learn (Salwan & Rahmatan, 2018). The student

worksheets that is prepared, designed, and developed must also follow the conditions found in the activity (Nadifatinisa & Sari, 2021).

Mostly, students cannot demonstrate their academic achievements optimally according to their abilities. One of the reasons is that they often feel unsure that they will be able to complete the tasks assigned to them (Sabar & Napitupulu, 2021). Differences in the level of self-confidence possessed by individuals will certainly influence learning achievement. Individuals with high self-confidence will achieve good achievements because they always think positively and believe in their abilities (Purba et al., 2022). Self-confidence is an attitude or feeling of confidence in one's abilities so that the person concerned is not too anxious in their actions, can feel free to do things they like, and are responsible for their actions. Wicaksono and Prihatnani (2019) also stated that self-confidence is a feeling of confidence in one's ability to unite and mobilize motivation and all the resources needed and bring them into action by what must be completed, according to task demands. Individuals with high self-confidence will achieve good achievements because they always think positively and believe in their abilities (Sabar & Napitupulu, 2021). The student worksheets learning tool is a tool that is very helpful and simplifies learning activities so that the learning process becomes more effective between students and teachers and can increase student activity and learning achievement (Nadifatinisa & Sari, 2021).

Assessment of learning outcomes is expected to help students improve their high-level thinking skills or HOTS because high-level thinking can encourage students to think broadly and deeply about the subject matter (Fanani, 2018; Yusuf et al., 2020). Assessments developed by teachers are expected to encourage increased high-level thinking skills, increase creativity, and build students' independence to solve problems (Sofiyan et al., 2020). Based on semester test score data of class X of senior high school students, there are still many students who get scores below the KKM due to the lack of teachers providing high-level thinking evaluation test questions so that they do not match students' cognitive abilities. Therefore, it is deemed necessary for teachers to develop creative, innovative, and critical HOTS question based student worksheets according to the cognitive domain. This research aims to find out whether the group student worksheets method is more effective than the individual student worksheets method in solving questions and whether there is an interaction between the method and the level of student confidence in solving HOTS questions.

Methodology

Research design

This research was experimental research using a 3x2 factorial treatment design. The Anava model used was $X_{ijk} = \mu + \alpha_i + \beta_j + \alpha\beta_{ij} + \varepsilon_{ijk}$ (Keppel, 1982). In the linear model above, X = ability to solve HOTS questions, X_{ijk}= observing on the subject to K under the combination of the effect of the ab_{ij} factor treatment with the index i = 1,2,3 and index j = 1,2. Component μ = overall average (grand mean), α_i = influence of factor A at the i level on X, β_j = influence of factor B at the j level on X, $\alpha\beta_{ij}$ = combination of interaction effects between A and B on X, and ε_{ijk} = error factor in X_{ijk}.

Data collection

The population of this research was all students in class X at SMAN 7 Denpasar, totaling ten classes with a total number of students of 420 students. The sampling technique used was a multi-stage random sampling technique. The first stage was to choose three classes from the ten existing classes. The next stage was to determine the classes that would be given treatment using the A1, A2, and A3 methods. Before the experiment was carried out, the three groups were equalized using one-way ANOVA. The data analyzed were block test scores in the middle of the semester to maintain equality between groups before the experiment (Sugiyono, 2013).

Data analysis

Data analysis in this research used descriptive analysis and factorial ANOVA. If the test results are significant, a further mean difference test is carried out (Sugiyono, 2013). Descriptive analysis was to get an initial picture of the ability to solve HOTS questions in each group. The descriptive analysis includes minimum, maximum, mode, average, standard deviation, and skewness scores. Before using ANOVA to test hypotheses, the conditions for normality and homogeneity of variance must be met. Liliefor's statistics were used to test normality, and Levene's test to test homogeneity of variance. All analyses used the SPSS version 22 program.

Results and Discussion

The following table shows descriptive statistics of the ability scores to complete HOTS questions in the three groups.

Table 1. *Descriptive statistics of HOTS question scores in each group*

Group	Min	Max	Mean	Median	Variance	SD	Skewness	Kurtosis
Group student worksheets	55	82	70,93	73,0	55,9	7,5	-0,379	-0,690
Individual student worksheets	50	82	66,25	66,0	70,86	8,4	0,137	-0,754
Conventional	42	83	59,65	60,0	111,87	10,6	0,213	-0,629

The results of the normal distribution assumption test and variance between homogeneous groups as ANOVA requirements are presented in the following table.

Table 2. *Normality test results*

	Learning Methods	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Score Completing Hots Questions	Group student worksheets (a1)	0.134	40	0.067	0.954	40	0.105
	Individual student worksheets (a2)	0.125	40	0.115	0.969	40	0.345
	Conventional student worksheets (a3)	0.101	40	.200*	0.97	40	0.355

*. This is a lower bound of true significance.
a. Lilliefors Significance Correction

In Table 2, the three groups from the Learning Method treatments a1, a2, and a3 have the probability value (Sig.) of the Kolmogorov-Smirnov statistic > 0.05. It means Ho, which states that the sample comes from a normally distributed population is accepted. Therefore, the condition for normality of distribution was met. The homogeneity of variance test in the three groups showed homogeneous results (Sig.0.354 > 0.05).

Table 3. Tests of between-subjects effects

Dependent Variable: Scores for Solving Hot Questions					
Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Model	520611.488[a]	6	86768.581	1268.561	0
Method	2576.648	2	1288.324	18.835	0
PD	956.991	1	956.991	13.991	0
Method * PD	547.046	2	273.523	3.999	0.021
Error	7797.512	114	68.399		
Total	528409	120			

a. R Squared = .985 (Adjusted R Squared = .984)

The results of simple influence test calculations are presented in Table 3a and 3b below.

Table 3a. *Score at high level (b1)*

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	360.698	2	180.349	2.466	0.094
Within Groups	3948.811	54	73.126		
Total	4309.509	56			

Table 3b. *Score at low level (b2)*

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2878.728	2	1439.364	22.439	0
Within Groups	3848.7	60	64.145		
Total	6727.429	62			

In Table 3a above, the F-count = 2.466 is not significant because the probability value (sig.) = 0.094 > 0.05. It means that the difference in the means of the three groups at high levels of self-confidence does not really occur in the population. However, Table 3b shows that the F-count = 22,439 is very significant because of the probability of Sig. = 0.000 ... < 0.05. It means that at a low level of self-confidence, the application of the student worksheets method has a significant effect.

Table 4. *LSD test results from Duncan*

Pairwise Comparisons

Dependent Variable: Score at Low Level

(I) Method at the low level	(J) Method at the low level	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
Group student worksheets	Individual student worksheets	6.874*	2.443	.007	1.987	11.762
	Conventional	16.536*	2.474	.000	11.587	21.486
Individual student worksheets	Group student worksheets	-6.874*	2.443	.007	-11.762	-1.987
	Conventional	9.662*	2.502	.000	4.656	14.667
Conventional	Group student worksheets	-16.536*	2.474	.000	-21.486	-11.587
	Individual student worksheets	-9.662*	2.502	.000	-14.667	-4.656

Based on estimated marginal means

*. The mean difference is significant at the 05 level.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

The null hypothesis is formulated as follows H_{01}: $\alpha_i=0$, for all scores of i, against the alternative hypothesis H_{11}: $\alpha_i\neq0$, for at least one score of i. H_{02}: $\beta_j=0$, for all scores j, H_{12}: $\beta_j\neq0$, for at least one score j. As well as H_{03}: $\alpha\beta_{ij}=0$ against H_{13}: $\alpha\beta_{ij}\neq0$, for at least one score of i and j, if confirmed with Table 3, it appears that all three show significant results because the

probability (Sig.) < 0,05. Therefore, the three null hypotheses are rejected, and the alternative hypothesis is accepted. It means that there is a significant difference in the influence of the use of the Group student worksheets (a1), Individual student worksheets (a2), and Conventional (a3) methods on the ability to solve HOTS questions. Furthermore, there is also an interaction effect from using the method with the 'Confidence' level at a real level of 5%. The next step is to carry out a difference test between the means of the three experimental groups. Since the ANOVA test above only shows differences between groups a1, a2, and a3, it is not yet known which groups are different. To test which pairs are different, a statistical test of the difference in the average LSD distance from Duncan is carried out.

Table 4 shows a significant difference between the group student worksheets and the individual student worksheets of 6.874 with a significance level = 0.007 < 1%. Likewise, the difference between the group student worksheets and the conventional group is 16.538 with a significance level of 0.000... < 1%. Furthermore, the average difference between individual and conventional student worksheets is 9.162 with a significance level of 0.000... < 1%. The results above mean the student worksheets method for groups with low levels of self-confidence is the most effective of the other two groups. Likewise, the use of the individual student worksheets method is more effective than conventional at low levels of self-confidence. However, at high levels of self-confidence, the use of the three methods is not significantly different. The findings obtained in this research are that it is paramount to foster self-confidence among students. The role of the teacher is not only as a transferer of knowledge but is also expected to always foster students' self-confidence. It means that in public schools, students have sufficient basic abilities to study mathematics at the high school level. By encouraging them to believe that they are capable, their latent potential as a latent trait will emerge. If their self-confidence has risen, they will be able to solve math problems that are classified as HOTS questions. Maybe it is just a matter of time that some of them are faster, and some are slower in completing it.

Conclusion

Based on the results of the analysis and discussion, the conclusions are: (1) The group student worksheets method is more effective than conventional methods in the ability to solve HOTS questions, (2) The Individual student worksheets method is more effective than conventional methods in the ability to solve HOTS questions, (3) The group student worksheets method is more effective than the Individual student worksheets method in the ability to solve HOTS questions, and (4) There is an interaction between the method and the level of confidence in solving HOTS questions which is acceptable. The results of further tests in the form of a simple effect as a consequence of the interaction showed that significant differences between group averages only occurred in the sub-group of students with a low level of self-confidence. The results of these findings recommend that mathematics teachers always raise students' self-confidence before the delivery of the material begins. With high self-confidence, differences in learning methods do not have a significant difference. High self-confidence can help improve one's abilities to the maximum.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest.

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