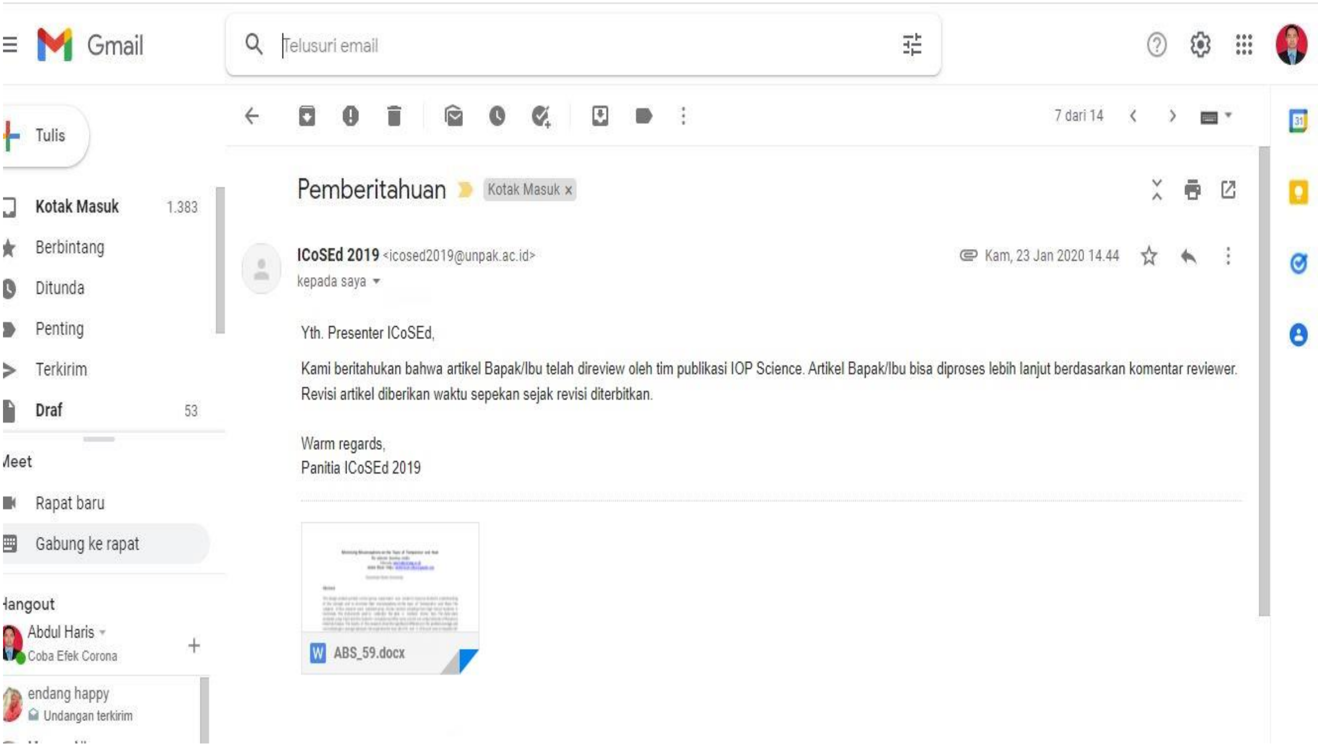
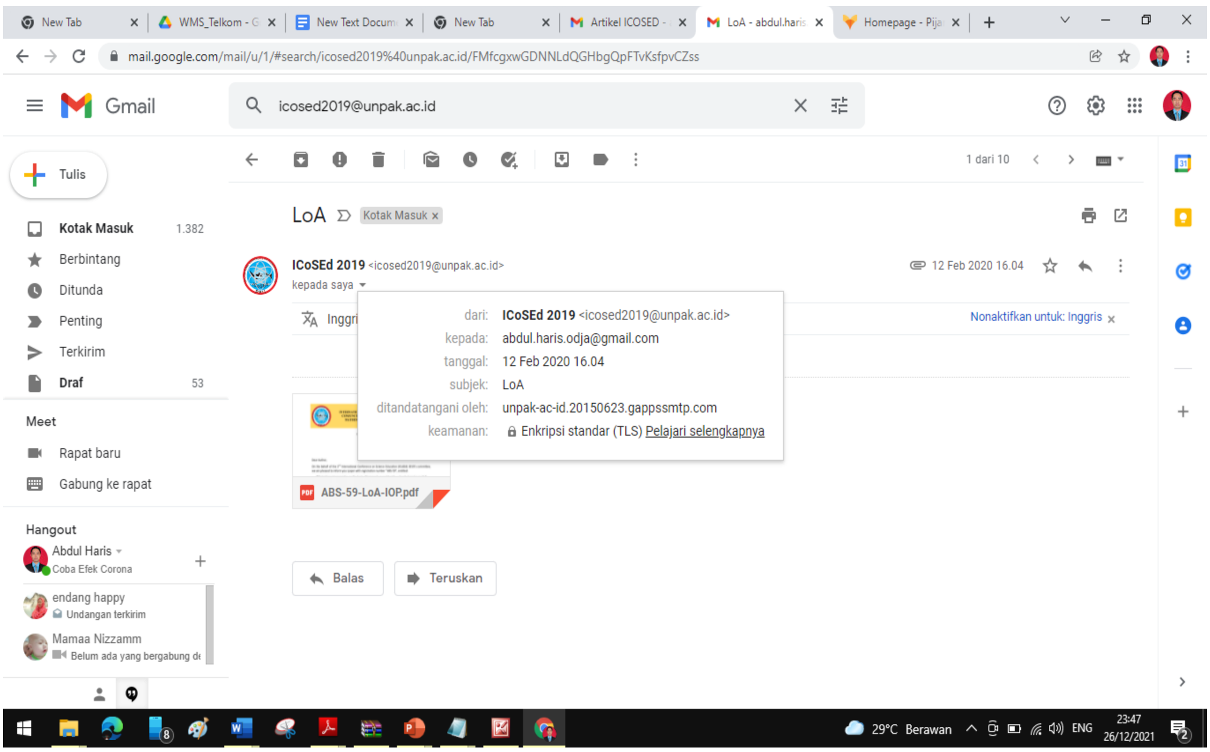
6. Minimizing misconception on the topic of temperature and heat by edmodo learning media"





Minimizing Misconceptions on the Topic of Temperature and Heat by Edmodo learning media

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Dikomentari [A1]: In general, good articles, can be published through IOP publications

Abstract

This design pretest-postest control group experiment was aimed to improve student's understanding of the concept and to minimize their misconceptions on the topic of Temperature and Heat. The subjects of this research were selected ‘using cluster random sampling from High School students in Gorontalo. The instruments used to collected the data is multiple choice test. The data were analyzed using t-test and the students' conception profiles were carried out using Certainty of Response Index technique. The results of this research show the significant difference in the posttest average and normalized gain average between the experimental class (81.976 and 0. 679) and control class(68.267 and 0. 437)and t_{count} = 12. 575 greater than t_{table} = 2. 000 on the confidence level 0.05. This results of research are supported by the fact that misconceptions in the experimental class are smaller than those in the controlclass. The implementation of Edmodo learning media is effective to improve student's understanding of the concepts and minimize their misconceptions on the topic of Temperature and Heat.

Dikomentari [A2]: 1. Writing adapted to the title, introduction of the method to the reference adapted to the IOP publication template
2.Images and graphics comply with IOP publication rules

Keywords: Edmodo, Understanding of Concept, Misconception, Optic

INTRODUCTION

Improper understanding of concepts is called misconception (Novak &Gowin,1984; van den Berg, 1991; Dahar,1996; Indrawati,1997; Prasetyo, 2001; Suparno,2005). Some researchers explain the difficulties of students in understanding the concept of kinematics (Sutopo,et al., 2012; Trowbridge & McDermott, 1980; McDermott, et al., 1987; Halloun & Hestenes,1985). Students' difficulties in understanding the concept of physics trigger misconceptions. Student misconceptions in physics occur if conception contradicts the conception of experts. Some physics education researchers such as van den Berg (1991) and Dahar (1996) define a concept as a grouping of a number of objects, phenomena, events, or processes reviewed from their characteristics. .

Concepts are the most important aspects of the process of learning physics. A proper understanding of the facts, concepts, principles, and laws of physics can be practiced by the theory of constructivism. This theory states that the student must actively construct his knowledge and turn it into a complete understanding, and the teacher facilitates it by providing means, learning resources. and an environment conducive to constructing his knowledge, stimulating curiosity and helping students communicate his ideas, as well as monitoring and evaluating students' activities in the learning process (Suparno,1997).

The concept of physics based on constructivism is believed to be done through information technology media that utilize the internet network(online). The Regulation of the Minister of National Education No.16 of 2007 states that the competence of teachers who are expected to be mastered is to utilize information technology media for the benefit of learning melting activities. The challenges of 21st century learning and curriculum changes of 2013 demand the pedagogical ability of teachers to be able to design more engaging and meaningful learning by utilizing the internet network.

Learning media is an important component in the learning system whose main function is to convey the content or subject matter in order to be understood by [2]learners. Proper use of learning media will help create effective, efficient, and interesting learning programs. Recent developments show that digital technology and internet networks have had a significant influence on students' learning activities in acquiring information and knowledge. The use of technology in learning systems gives rise to *e-learning-based* learning (electronic-based learning) that transforms conventional model learning systems into media models, including Edmodo learning media.

According to Brown and Feasey, *e-learning* media such as Edmodo learning media is an activity that utilizesinternetnetworks, LANs, WANs as a method of delivery, interaction, and facilities and is supported by various other forms of learning services. [3] Onno W Purba states that *e-learning* is a form of information technology applied in the field of education in the form of virtual [4]schools. *E-learning* is a learning concept that is interpreted as the use of internet technology used to access the curriculum along with learning resources that contain information and knowledge outside the conventionally organized education system. [2]

Based on the description above, the study describes efforts to improve the understanding of concepts and minimize student misconceptions on the topic of Temperature and Heat by using the media. Edmodo teachings.

METHOD

The subject of this experimental study was an X-grade high school student who was selected with a random sampling cluster technique at a school in Gorontalo. The number of respondents was 32 students of experimental classes and 32 students of control classes. This research uses the design of the Pretest-Posttest Control Group Design (Sugiyono, 2006; Cohen & Manion, 1994).

To uncover conceptual understanding, students are asked to provide a confidence-level score about the accuracy of a given answer by using an n scale of 0 to 5. Score 0 states guessed 100% (totally guessed answer), score 1 states guessed 75% - 99% (almost guess), score 2 states guessed 50% - 74% (not sure), score 3 states guessed 25% - 49% (sure), score 4 states guessed 1% - 24% (almost), and a score of 5 states very confident (certain). The combination of the accuracy of the answer and the level of confidence of the student in answering the exam question is used to state the level of understanding of the students' understanding of the concepts of temperature and heat tested such as Presented in Table 1.

Table 1. Rubric level of understanding of students according to the accuracy of answer and confidence level

Answer	Level of Understanding According to Confidence Level Score					
	5	4	3	2	1	0
True	Very good	Good	Enough	Weak		
Wrong	Misconceptions			Weak		

(adapted from Hasan et al. , 1999; Potgieter et al. , 2010).

Table 1 exposure is categorized into concept understanding, misconception, and not understanding concepts. Stage pretest aims to know the level of homogeneity of understanding of student concepts, while pastes aims to know the difference in understanding of student concepts between experimental and experimental classes. control classes on temperature and heat topics. The average normalized gain <g>t class of experiments and control classes is calculated from the results of pretest and posttest using hake equations (1998). The average normalized gain is classified as in Table 2.

Table 2. Classification of Average Values of Analyzed Gains

Hake	No.	Calculate<g>	Classification
$< g > = \frac{< X_f > - < X_i >}{100 - < X_i >}$	1.	$< g > \geq 0.7$	Tall
	2.	$0.3 \leq < g > < 0.7$	Keep
	3.	$< g > < 0.3$	Low

Nilai calculated the average normalized gain of experimental classes and kontrol classesfound experimental success, while differences in students' understanding on temperature and heat topics were analyzed using t-tests at an error rate of 0.05.

RESULTS AND DISCUSSIONS

Average scores of pretes, postes, and gains normalized experimental classes and control classes are presented in Table 3.

Table 3. Average Scores of Pretes, Postes, and Normalized Gains

Average Pretes		Average Postes		Average Gain	
Experiment	Control	Experiment	Control	Experiment	Control
43,8	43,6	81,967	68,267	0,679	0,437

Exposure to Table 3 that average pretested results score showed no difference in students' initial understanding between the experimental class and thekontrol or homogen class. However, the average score of postes results shows differences in understanding the concept of antara experimental class and control class, which occurs in the average calculation value of normalized gain <g>g in the mediumcategory.

The t-test result obtained t_{count} (3.743) greater than t_{table} = 2,000 for error rate 0.05 and degree of freedom 62. These results showed differences in students' understanding on temperature and heat topics between experimental classes and control classes after the application of edmodo learning media. This means the application ofmedia edmodo learning is effective in improving the understanding of student concepts on topics of temperature and heat. These results are similar to the results of Mursalin's (2014) study that the application of predict-observe-explain (POE) learning models effectively improves concept understanding and minimizes students' misconceptions on electrical circuit topics; Santoso et al. (2007) that the application of POE learning models is able to improve the mastery of students' generic concepts and skills in dynamic fluid materials.

The application of *CRI* techniques and short interviews can be described as triggering student misconceptions on temperature and heat topics. **First,**75%of the32 students of the experimental class and 78% of the control class students stated that the water in glass A and glass B of the same temperature were mixed in glass C, the temperature of the mixed water became twice the temperature of glass A or glass B. Likewise the water in glass A is poured equally much into glass B and glass C, Then the temperature of the water in glass B and glass C becomes half of the original temperature. They reasoned that the mass of water increased to twice the original mass or halved from the original mass. In the case if measured using a thermometer will get the temperature of the water in glasses A, B, and C is the same.

Second, 88%of the 32 experimental students and 81%ofcontrol class students stated that if two objects of the same mass with different temperatures touch each other there will be a flow of temperature from high-temperature objects to low-temperature objects. They reasoned that the temperature could flow as it did with water flowing from high to low. They cannot distinguish between temperature and heat. In the event that if asked to heat one end of the metal rod and the other end is held will get the metal end held to heat.

Third,91%of 32 experimental class students and 94%of control class studentsstated that if two objects of the same mass and temperature but different heat capacities touch each other there will be a flow of heat capacity from objects that have high heat capacity to objects that have low heat capacity. They also stated that if two objects of the same mass and temperature but different types of heat touch each other there will be a flow of type heat from objects that have high type heat to objects that have low type heat. In terms of heat capacity shows the characteristics of objects and type heat shows the characteristics of substances that cannot move from one object to another.

Fourth,97%of the 32 students of the experimental class and 88% of the control class students stated that if two objects of the same mass but the heat of different types and heated together turned out that both objects had the same heat. They also stated that if two objects are mass but the heat capacity is different and heated together it turns out that both objects have the same heat. In the case of objects that have a large type of heat and heat capacity will heat faster than objects that have a small type of heat and heat capacity.

Thefifth,84%of the32 students of the experimental class and 91%of the control class studentsstated that if 100 grams of ice with a temperature of -10^{o}C is heated to water vapor then the temperature of the ice always rises and is never constant. In the event that if you pay attention to the graph of the relationship between the increase in temperature and the amount of heat absorbed by the ice will be obtained the following stages: Ice temperature rises from -10^{o}C to icetemperature 0^{o}C, ice temperature remains from 0^{o}C ice towater 0^{o}C, water temperature rises from 0 ^{o}Cto 100 ^{o}C, The water temperature remains from 100 ^{o}C of waterto 100 ^{o}Cof steam, then rises again.

The findings of the misconceptions as described above are re-proof or verification of some of the results of research in Indonesia as revealed by van den Berg (1991), Suparno (2005),and Tiberghien (1985) in France. Their research findings revealed that the occurrence of misconceptions on the topic of temperature and heat is caused by the initial concept or preconception of students. They mention the many numbers and types of misconceptions of students on the topic of temperature and heat, for example temperature, heat type and capacity are considered as something that can flow, the difference in understanding between temperature and heat, heat as a form of energy that can flow, thermal equilibrium, and the nature of change in form.

After treatment, profiles of students who understand concepts, do not understand concepts, and misconceptions on temperature and heat topics in experimental classes and control classes are presented as in Table 4.

Table 4. Percentage of students who understand concepts, do not understand concepts, and misconceptions

Understand the concept (%)		I don't understand the concept (%)		Misconception (%)	
A	B	A	B	A	B
97	88	0	6	3	6

A: Experimental class B: Control Class

Table 4 exposure shows that the average profile of the percentage of students who understand the concept appropriately on the topic of temperature and heat for the experimental class is higher than the control class. The application of edmodo learning media and conventional/traditional learning are both able to improve the understanding of students' concepts classically on temperature and heat topics above the minimum completion criteria, 75%. Conventional learning models are able to contribute to the improvement of student understanding through appropriate learning methods and scenarios according to student characteristics and materials. Furthermore, the application of medhe edmodo learning is superior in minimizing the occurrence of misconceptions on the topic of temperature and heat inthe comparisonof conventional learning. This is indicated by the average percentage profile of students who experienced misconceptions for the experiment class was smaller than the control class. These findings reinforce the theory that misconceptions can be reduced but cannot be removed entirely with certain learning models (Suparno, 200%). Mursalin's research results (2013) stated that the worksheet-assisted PhET simulation model can be used to remediate and minimize the misconceptions of prospective physics teachers on the topic of electrical circuits. Sutopo (2016) mentionsthe failureofstudents in solving the conceptual problems of mechanical waves due to misconceptions.

Conclusion

There is a difference in students' understanding on the topic of temperature and heat between students who study with edmodo learning and students who study with conventional learning. Students who study with edmodo learning are superior in improving concept understanding and minimizing misconceptions than students who learn with conventional learning. Edmodo learning is recommended to be applied to learning with other topics in physics or to science (physics, chemistry, biology) in an effort to enrich the results of misconception research. Di recommend further research by using edmodo learning media to test the level of consistency of previous findings in an effort to improve the quality of physical learning processes and outcomes in schools.

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LETTER OF ACCEPTANCE

February 13th, 2020

Dear Author,

On the behalf of the 2nd International Conference on Science Education (ICoSEd) 2019's committee, we are pleased to inform your paper with registration number "ABS-59", entitled:

"Minimizing misconception on the topic of temperature and heat by edmodo learning media"

Written by: *Mursalin ; A H Odja*

Has been **ACCEPTED** and will be proceed to be published in Journal of Physics Conference Series. Your manuscript has been reviewed by science education expert.

Each submitted script will be charged a contribution fee of **IDR 1.500.000** or **USD 108**. The payment is made via bank transfer to **BANK MANDIRI** on behalf of **ANNISA NURRAMADHANI** with account **1340005200257.** Payment deadline **February 20th, 2020**. After you have done the payment, please confirm your payment as follow the format:

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Kindest Regard,

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