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Implementation of the WASAKA Learning Model on the Topic of Heat and Temperature

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Abstract

This research aims to delineate the implementation of the WASAKA learning model and describe students' responses to this learning model through a one-to-one test. This study employed the Educational Design Research (EDR) methodology, encompassing two stages: the preliminary stage and the formative evaluation stage. Ten students participated in a one-to-one test during a single meeting, focusing on learning heat and temperature topics in the Fundamental Physics lecture. Research instruments included observation sheets and response questionnaires, with data analyzed using descriptive statistics. The results of the data analysis revealed an average score of 5.00 for implementing the WASAKA learning model, categorizing it as "very good." Additionally, students' responses to this learning model were highly positive. The conclusion drawn from this research is that the WASAKA learning model is well-suited for application in Fundamental Physics lectures covering heat and temperature topics.

Keywords: implementation; heat and temperature; WASAKA learning model

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INTRODUCTION

Physics is often perceived as a challenging scientific discipline (Fautin et al., 2020; Ulfah et al., 2022) due to its abstract concepts and principles (Fautin et al., 2020; Mayub, 2020), a characteristic shared by the temperature and heat topic. Maison et al. (2019) asserted that this topic involves numerous abstract concepts and principles, such as temperature, heat, latent heat, heat transfer by conduction, convection, radiation, etc., potentially leading to misconceptions.

Despite abstracting certain concepts, phenomena, and symptoms related to temperature and heat can be observed in everyday life (Maison et al., 2019; Wati et al., 2021). These tangible experiences, such as cooking, drying clothes, making cold drinks, selecting clothing for warmth, and natural occurrences like land and sea breezes and rising smoke, can serve as relatable examples. However, student learning outcomes in temperature and heat material, along with the challenges faced during lectures, indicated a need for a learning model to bridge the gap between abstract concepts and everyday life, facilitating students' comprehension. The integration of local wisdom into the model is also seen as beneficial (Wati et al., 2021), with existing studies highlighting the ease of understanding

material, knowledge building based on the local environment, and dispelling misconceptions through the inclusion of local wisdom (Arfianawati et al., 2016; Damayanti et al., 2017; Wati et al., 2019).

This study endeavors to develop a learning model infused with local wisdom called the WASAKA learning model. This model comprises six learning stages: Write, Analyze, Share, Argue, Knowledge Development, and Act. At the Write stage, students make a summary of the information obtained from the lecturer; at the Analyze stage, they are asked to analyze physics problems; at the Share stage, they share information with their friends; at the Argue stage, they express opinions to find the right solution to solve physics problems, at the Knowledge Development stage they work on physics problems that are more difficult than before, and during the Act stage they make posters containing local wisdom related to temperature and heat.

Each stage of the WASAKA learning model incorporates the local character of the people of South Kalimantan, namely *waja sampai kaputing*. The local character, then known as *wasaka*, has become the motto of South Kalimantan (Nadilla, 2017). This motto was coined by Prince Antasari, a National Hero from South Kalimantan (Syaifullah & Surawardi, 2020). This motto means to work hard until the goal can be achieved (Nadilla, 2017; Syaifullah & Surawardi, 2020). Thus, the WASAKA learning model is sourced from the local wisdom of South Kalimantan, which is based on the character values contained in *wasaka* (Sarbaini, 2014). This learning model provides opportunities for students to get to know their local wisdom and analyze the concepts and principles of physics in the local wisdom of South Kalimantan.

Many studies have been carried out on learning containing local wisdom. Previous researchers have carried out these studies. These studies include learning video-based ethnoscience (Adhi et al., 2018), local culture integrated science learning through project assessment (Parmiti et al., 2021), and local wisdom-based learning with HOTS-based assessment instruments (Abidinsyah et al., 2019). However, no researchers have developed the WASAKA learning model with six learning stages relevant to the character of *waja sampai kaputing*. This is the advantage of this research.

The developed model necessitates testing, with the initial test involving a one-to-one test with ten students participating in Basic Physics lectures covering the topic of temperature and heat. Therefore, this article focuses exclusively on the results of the one-to-one test, aiming to describe the implementation of the WASAKA learning model and students' responses to this testing phase.

METHOD

The researchers employed Educational Design Research (EDR), a type of development research. This research involved two main steps, namely the preliminary stage and the formative evaluation stage (Tessmer, 2016). The preliminary stage was the initial preparation stage. At this stage, the researcher analyzed the problems found in physics learning. The researcher also determined the place, subject, and research schedule. The researcher also developed the first format draft of the lesson plans, teaching materials, and instruments. The one-to-one test constituted a component of the formative evaluation stage, with a sample of ten students enrolled in Basic Physics lectures during the 2021/2022 academic year, specifically focusing on the topic of temperature and heat. This test was conducted as a single event.

During the one-to-one test, data collection took the form of both lecturer and student activities, aligning with the stages of the WASAKA learning model. Furthermore, the data collected included student responses to the learning model obtained through observation and surveys. The data collection instruments comprised observation sheets and Likert scale

questionnaires. Two questionnaires were utilized: the learning model implementation questionnaire in the classroom, completed by the observer, and the student response questionnaire to the learning model, filled out by the students. All instruments used were validated according to Aiken's criteria (Aiken, 1985).

Data analysis of the data that had been collected using descriptive statistics, namely the average, standard deviation, and variance. Furthermore, based on the average score obtained, it was categorized into several categories based on the category. It can be seen in Table 1 (Widoyoko, 2019) and Table 2 (Riduwan, 2015). Based on this analysis, discussions and conclusions were drawn.

Table 1 The category of learning model implementation

Average of Score	Category
$X > 4.21$	Very good
$3.40 < X \leq 4.21$	Good
$2.60 < X \leq 3.40$	Medium
$1.79 < X \leq 2.60$	Not good
$X \leq 1.79$	Very not good

Table 2 The category of student responses

Percentage	Category
81% - 100%	Very good
61% - 80%	Good
41% - 60%	Medium
21% - 40%	Not good
0% - 20%	Very not good

RESULT AND DISCUSSION

Implementation of the WASAKA Learning Model

The implementation of the WASAKA learning model was viewed from two aspects: the implementation of lecturer activities and the implementation of student activities. Both activities are based on the steps of the WASAKA learning model: Write, Analyze, Share, Argue, Knowledge Development, and Act. The implementation of these two activities can be seen in Figure 1.

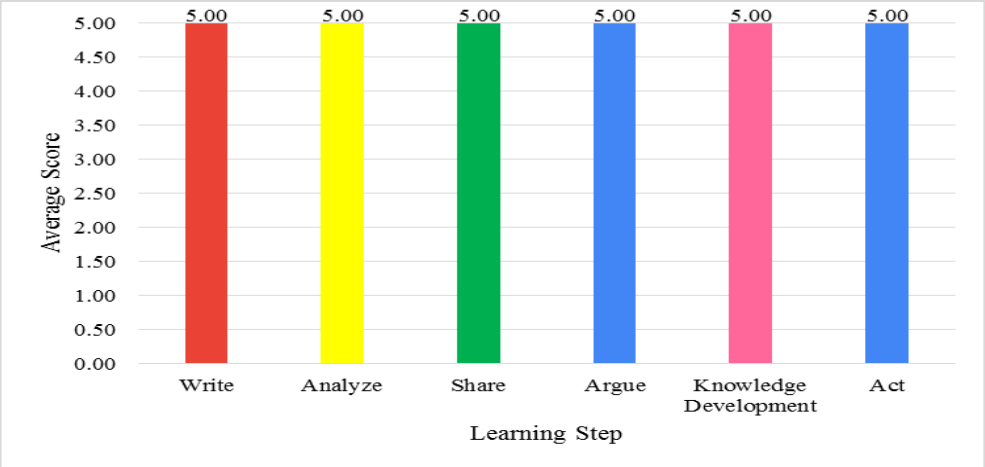

Figure 1 Implementation of lecturer activities on the one-to-one test

The results of the excellent activities of lecturers and students show that the practical model was implemented in the classroom (Ghaida et al., 2021; Mellenia & Admoko 2022). In addition, this means that the steps of the WASAKA learning model listed in the Weekly Lesson Plan are implemented appropriately and appropriately in classroom learning (Wahyunita & Subroto, 2021). This also shows that the lecturer can manage the class well, and the learning process went very well (Wahyunita & Subroto, 2021).

Based on Figure 1, it can be seen that the implementation of lecturer activities at each stage of learning was very good. The average implementation of lecturer activities was 5.00, with a very good category. The standard deviation was 0,00, and the variance was 0,00. The activities of lecturers at each stage of learning can be explained as follows.

At the write stage, the lecturer presented information about temperature and heat. Next, the lecturer asked the students to summarize the information. The lecturer then asked the students to look for information on the material discussed from various relevant and reliable sources.

At the Analyze stage, the lecturer gave assignments to students to solve problems with cognitive level C4: Analysis based on Bloom's taxonomy. Students must complete this task independently. The questions given were physics questions that were relevant to the local wisdom of South Kalimantan. At the Share stage, the lecturer asked students to study in small groups to share information. The information shared was the summary they had written, the information they had obtained from various sources, and the answers to questions in the Analyze stage. Thus, at these two stages, the lecturer directed students to actively learn reasoning and critical thinking (Ratri & Azhar, 2022) and higher-order thinking skills (Ulfah et al., 2022).

The next stage was Argue. At this stage, the lecturer assigned students to exchange opinions about the correct answers to the questions given by the previous lecturer. Afterward, the group representatives were asked to present their answers to the class. The other groups were asked to give their opinion on the results of the work presented.

The fifth stage of the WASAKA learning model was knowledge development. At this stage, the lecturer gave practice questions to students with a higher difficulty level than the previous ones.

The last stage was the Act. At this stage, the lecturer gave the task to the students to make a poster containing the local wisdom of South Kalimantan and examine the principles of temperature and heat in the local wisdom. The poster was then shared on social media and Instagram. Thus, these social media users can get to know the local wisdom of South Kalimantan and know that the principles of physics are contained in the local wisdom. This is the function of the learning model containing local wisdom, namely introducing local wisdom (Febriani et al., 2020), instilling a sense of pride in the local culture (Astuti & Bhakti, 2021), and establishing relevance between science and everyday life (Xuto, 2019).

In this WASAKA learning model, the lecturer appeared to be a facilitator. This is to the constructivist learning theory, which is the root of the WASAKA learning model (Masgumelar & Mustafa 2021). This theory states that lecturers design learning so that students are actively learning, and lecturers provide all facilities and a learning environment that supports the knowledge construction process by students (Masgumelar & Mustafa 2021). Lecturers must also encourage students to actively learn through varied activities and prepare comfortable conditions for them to study (Mokalu, Panjaitan, Boiliu, & Rantung, 2022).

The implementation of these two activities can be seen in Figure 2.

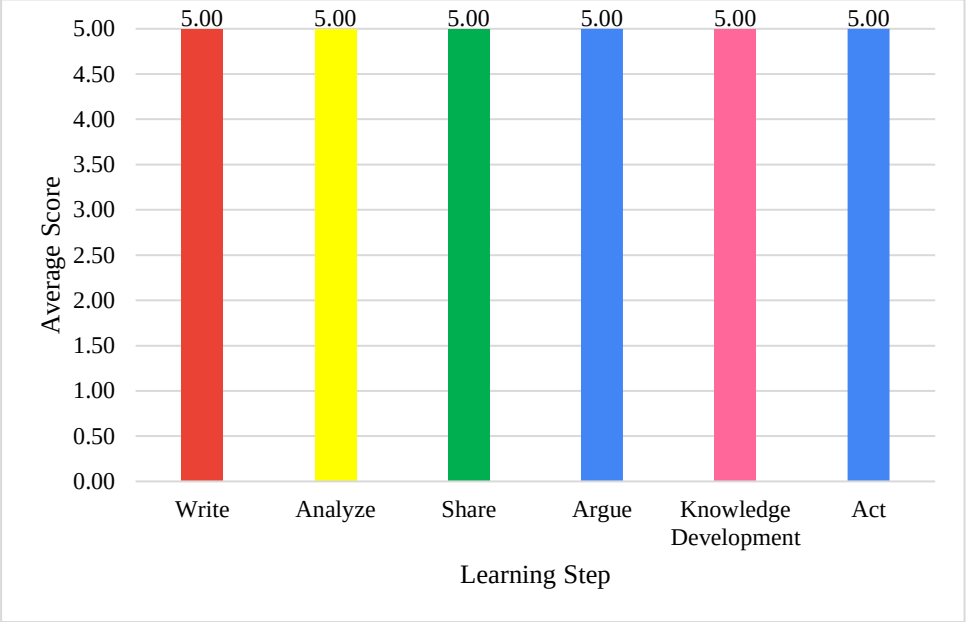

Figure 2 Implementation of student activities on the one-to-one test

Based on Figure 2, it can be seen that the implementation of student activities at each stage of learning was very good. The average implementation of student activities was 5.00, with a very good category. The standard deviation was 0,00, and the variance was 0,00. The student activities at each stage of learning can be explained as follows.

At the Write stage, the students paid close attention to the temperature and heat information presented by the lecturer. Next, the students summarized the information. Students also seek information about the material discussed from relevant and reliable sources.

In the Analyze stage, students solved temperature and heat problems associated with local wisdom in South Kalimantan. The cognitive level of this question was C4: Analysis based on Bloom's taxonomy (Anderson, 2013). Students must solve the problem independently.

The third stage was Share. The students learned to share information in small groups. They shared the summary information they had written, the information they got from various sources, and the answers to questions in the Analyze stage. Thus, at this stage, students actively communicated with their friends.

The next stage was Argue. At this stage, the students exchanged opinions about the correct answers to the questions given by the previous lecturer. After that, they presented their answers in front of the class. Students who did not present their work expressed opinions, suggestions, and criticisms of their friends' presentations.

The fifth stage of the WASAKA learning model is Knowledge Development. At this stage, the questions from the lecturer must be completed by students independently. If their grades are not up to standard, they must improve their work until they get good grades.

The last stage was the Act. At this stage, the students made posters containing the local wisdom of South Kalimantan and examined the principles of temperature and heat in that local wisdom. They then shared the poster on Instagram. This is done to promote the local wisdom of South Kalimantan. In addition, another goal is to inform the public that the principles of physics exist in local wisdom and the life around them, so they are expected to be interested in physics. This is the goal of learning containing local wisdom (Febriani et al., 2020; Astuti & Bhakti 2021; Xuto 2019).

Based on the six learning steps, students actively build their knowledge. This is to the basic principles of constructivist learning theory; namely, students socially and individually build knowledge, acquire knowledge by active learning in authentic situations, build continuous understanding so that a comprehensive and holistic understanding is obtained, and build relevance between knowledge old and new knowledge (Masgumelar & Mustafa, 2021). Students can also actively build knowledge through group work (Hapid, 2021). In addition, students must carry out knowledge construction independently because knowledge is not acquired by a transfer process from the lecturer to them (Mokalu et al., 2022).

Students' Responses to the WASAKA Learning Model

The researcher first developed the WASAKA learning model. Therefore, student responses as users of this model should be captured. It aimed to revise the compiled model before it entered the next test stage. Student responses to this model can be seen in Figure 3.

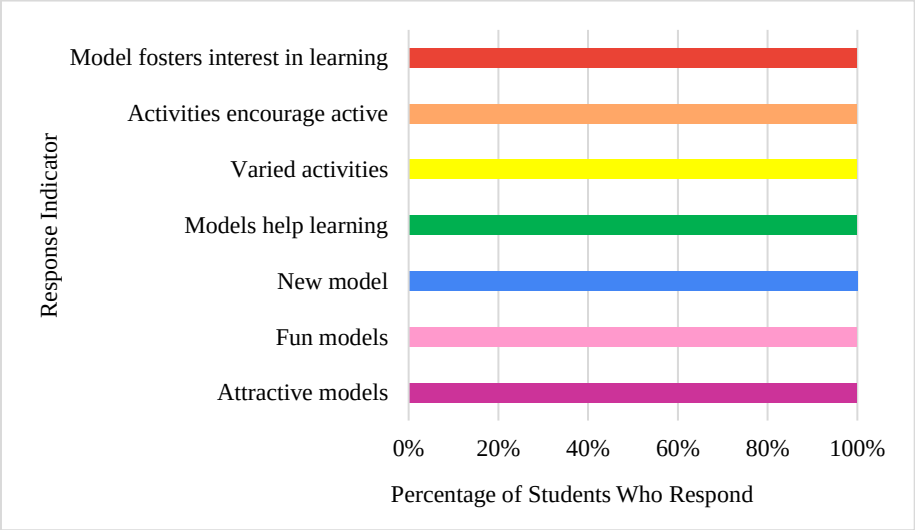

Figure 3 Student responses to the Wasaka learning model

Based on Figure 3, it is known that the WASAKA learning model received a very good response from students. All students stated that this learning model fosters interest in learning, encourages them to be active in learning, consists of varied activities, can help them learn, and is a new, fun, and interesting learning model. This indicates that the learning model developed is liked, desirable, useful, and can be reused (Rahayu et al., 2019). In addition, these results indicate that the students support the WASAKA learning model to be implemented in the classroom (Asri et al., 2020). The students, as respondents, also gave qualitative comments on the WASAKA learning model. The comments are as follows:

1. This learning model is very good because it encourages students to learn actively.
2. The learning model requires quite a long time because there are questions that are quite difficult so that they can spend much time in the process.
3. The learning model is interesting and fosters understanding for students.
4. The learning model consists of many stages of activity, so the time allocation should be adjusted for each stage, and the appropriate time should be given to solve the problem so that students can solve it well.

Based on these students' comments, the WASAKA learning model was revised to improve it before being tested again.

CONCLUSION

Based on the study results, it can be concluded that the implementation of the WASAKA learning model is very good, with an average score of 5.00, and students respond very well to this model. All students (100%) gave very good responses to this model. Thus, the WASAKA learning model with a one-to-one test was successfully implemented in Basic Physics lectures on temperature and heat. Furthermore, the learning model was revised according to suggestions to be tested further at the next research stage.

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