



Effectiveness of Using Physics E-Modules Based on Local Wisdom of Palembang City Food to Improve Collaboration Skills for High School Students

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Abstract: This research aims to determine the effect of the effectiveness of an e-module based on local food wisdom in the city of Palembang on the collaboration skills of high school students on temperature and heat material. This type of research is a quasi-experiment using the pretest-posttest method. The population of this study was class XI students of SMA Negeri 2 Palembang City. The data analysis technique uses quantitative data to analyze data collected from students' collaboration skill achievement scores. The results of data analysis show the average pretest on collaboration skills was 54. The average post-test score after implementing the e-module based on local food wisdom in Palembang on collaboration skills was 80. This shows that students' skills in collaboration skills have increased. after using e-modules based on local wisdom. The main finding of this research is that the application of an e-module based on local food wisdom in the city of Palembang is effective in improving students' collaboration skills. This is proven by the results of the N-gain test analysis showing that students with collaboration skills received a score of 0.72 in the high category.

Keywords: Collaboration skills; E-module; Local wisdom; Palembang traditional food

Introduction

Today science and technology are also developing very rapidly in all fields including education (Wiyono & Zakiyah, 2019). Education plays an important role in preparing a generation that can compete in the era of globalization accompanied by the rapid progress of modern technology (Sipayung et al., 2019). Education in the industrial era 4.0 must adapt to the characteristics and skills of students required in the 21st century (Yusuf & Asrifan, 2020). The 21st century learning reflects four learning objectives (4C) which refer to parts of learning to do, namely Critical Thinking, Creativity, Communication, and Collaboration (Susilo, 2015). 4C skills are competencies that must be mastered by the nation's children to be able to compete in life in the 21st century (Sipayung et al., 2019). Important skills that are

also needed by human resources in the 21st century are communication and collaboration skills. Communication and collaboration together closely reflect the adult world. In this context, effective communication and collaboration skills can help avoid misunderstandings and miscommunication. Collaborative learning also leads to the development of metacognition, improvements in formulating ideas, and discussions or debates with higher levels of thinking. This allows students to learn to monitor each other, detect each other's mistakes, and learn how to correct their mistakes (Zubaidah, 2020).

Learning in the 21st century also requires students to have skills, knowledge, and abilities in the fields of technology, media, and information as well as innovative learning skills (Putri & Syafriani, 2022). Learning itself is a facilitating process so that individuals

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can learn, or specifically it can be stated that learning is a learning process built by teachers to improve moral, and intellectual, and develop various abilities possessed by students, be it thinking ability, creativity ability, or construction ability. knowledge, problem-solving abilities, and the ability to master learning material well (Rahayu et al., 2022). Interesting and enjoyable learning can be created by utilizing technology by applying teaching materials to support the learning process. E-modules are alternative teaching materials that students use to increase knowledge about the concepts studied in systematic learning activities. E-module is an electronic module in digital form where access and use can be done via electronic devices such as computers, laptops, tablets, or smartphones (Putri & Syafriani, 2022). Physics as one of the subjects in high school, basically teaches students to be able to think scientifically and carry out collaborative activities according to the challenges of 21st-century education (Yusuf & Asrifan, 2020). Therefore, innovation is needed in the physics learning process at school.

Innovation usually originates from the school's willingness to respond to community needs and efforts to use schools to solve problems faced by the community (Laos & Tefu, 2019). The application of the use of technology will be better if we do not forget the local wisdom that exists in students' daily environment, namely the local wisdom that exists in society. Local wisdom is a view of life and knowledge as well as various life strategies in the form of activities carried out by local communities in responding to various problems in meeting their living needs (Hidayanto, 2016). Local wisdom is everything characteristic of an area, whether in the form of food, customs, dances, songs, or regional ceremonies (Maknun, 2017).

South Sumatra, especially Palembang, has various kinds of local wisdom, one of which is typical Palembang food. In the process of making and packaging food, there are Physics concepts that can be explained in learning. One way that can be done to make physics lessons collaborate with local wisdom is to develop teaching materials (Hidayanto, 2016). Teaching materials that are felt to be able to help students and teachers in the physics learning process by utilizing technology are e-modules. E-modules are modules that are adapted by utilizing technology because modules are usually identified with printed teaching materials (Qomalasari et al., 2021). The development of e-modules will certainly influence the implementation of learning carried out in the 21st-century skills era. The implementation of learning using physics e-modules based on local wisdom will influence students' collaboration skills.

Based on the results of initial observations carried out on students at SMA Negeri 2 Palembang, it is known

that the collaboration skills possessed by students already exist, but there are still many who have these skills in the low category. It can be seen that when given group discussion assignments, several students actively express opinions and discuss to complete the assignment, but there are still those who do not contribute to conveying ideas and completing group assignments. This shows the lack of students' collaboration skills in the learning process (Wiyono et al., 2022). Lack of mastery of these skills is certainly a challenge for teachers to create a generation that is brave in expressing opinions appearing in public and working collaboratively with other students (Redhana, 2019).

There are several relevant studies conducted by previous researchers including; research conducted by Hidayanto et al. (2016) with the title "Development of a High School Physics Module Based on Local Wisdom to Optimize the Character of Students" explains that the physics learning module based on local wisdom developed in this research is categorized as good and suitable for use in learning and can optimize the character of students (Hidayanto, 2016). Furthermore, research conducted by Suryani & Saparuddin (2022) with the title "Effectiveness of Using E-Modules in Improving Students' Collaborative Abilities on Class 10 Living Creature Classification Material at Sman 9 Makassar" shows that the collaborative learning model in using e-modules on creature classification material life in class X SMA 9 Makassar is effectively used in learning (Suryani & Saparuddin, 2022).

Based on previous research, integrating local wisdom into the learning process can foster students' critical thinking, reasoning, and creativity skills (Ridho et al., 2021; Sasmita et al., 2021; Suparmin et al., 2024). Apart from that, other research states that the application of local wisdom-based learning can improve student learning outcomes accompanied by increased communication skills (Sari et al., 2022). The research conducted by Nazhifah et al. (2022) shows an increase in students' scientific literacy skills after an assessment was carried out using a question instrument based on local wisdom in Bengkulu province. Apart from that, learning by integrating local wisdom can increase students' learning motivation, because the content and context discussed are relevant to students' daily lives (Nursakinah et al., 2022; Pujiastuti et al., 2020; Sari et al., 2023; Setiawan et al., 2017; Suastra et al., 2017). The research results showed that there was a significant positive impact after the local wisdom-based learning process was carried out. However, there is still very little research that discusses the influence of local wisdom-based learning on students' collaboration skills.

Based on the explanation of the background of the problem and previous research, research was conducted to determine the effect of implementing local wisdom-

based e-modules on the collaboration abilities of high school students on temperature and heat material. This research was conducted at SMA Negeri 2 Palembang. The results of this research can be used as a reference for creating meaningful learning experiences in improving students' skills.

Method

Participants

This research involved 44 high school students as respondents. Respondents consisted of 22 female students and 22 male students who were studying in class XI in the even semester of the 2022/2023 academic year at SMAN 2 Palembang.

Research Design and Procedures

This research is quantitative research using the One Group Pretest Posttest Design quasi-experimental method. The one-group pretest-posttest research design is research carried out on one group of students (Wiyono et al., 2022). Through the One-Group-Pretest-Posttest design, it will be seen how the influence of using a physics e-module based on local wisdom from typical Palembang food can improve the collaboration skills of high school students. Data collection through observation and documentation. Observations were made during physics learning. Before learning is carried out using an e-module based on local food wisdom in the city of Palembang, students are initially observed (pretest) to determine the student's initial collaboration skills. Next, apply the e-module that has been developed on temperature and heat material. During the learning process, a final observation (posttest) is carried out to determine the effect of implementing the e-module based on local food wisdom in the city of Palembang on students' collaboration skills. Observations were carried out by 3 people consisting of 2 people who were master's students in physics education and 1 physics teacher at SMA Negeri 2 Palembang.

Instrument

The instrument used is a non-test instrument in the form of a collaboration skills rubric. In the standard rubric, aspects that include collaboration skills are contribution, time management, problem-solving, working with other people, and investigation techniques (Think, 2015). Based on these aspects, the collaborative skills rubric developed (Hermawan, 2017) explains the design modifications of the collaboration skills rubric.

Instrument Data Analysis

Data analysis was carried out to determine the effect of implementing an e-module based on local food wisdom in the city of Palembang on students'

collaboration skills using a normality test, n-gain test, and statistical hypothesis testing using a one-group pretest-posttest design (Nasrum, 2018; Nugraha 2022; Purnomo, 2016).

Result and Discussion

Research related to students' collaboration skills was conducted at SMA Negeri 2 Palembang. As a teaching material that integrates the local wisdom of Palembang food with physics learning, the e-module has been specifically designed to simplify the learning process and improve the desired skills. In the learning process using an e-module based on local food wisdom in the city of Palembang, students are asked to observe learning video shows as encouragement to start learning, are given directions for discussion, and resolve existing problems in the discussion forum. Through discussion forums, it is hoped that students' collaboration skills can be improved. Improving students' collaboration skills is also carried out by practicing questions. At the end of each lesson, practice questions are available to hone students' abilities after studying. This activity is carried out to hone students' collaboration, make decisions, and allow students to work within the agreed period (Fitriani, 2020; Waluyo & Wahyuni, 2021).

It is hoped that students' collaboration skills will improve after the learning process is carried out using e-modules based on local food wisdom in the city of Palembang. This improvement in skills can be seen from the results of observations made before and after learning. The results of the students' pretest and posttest in the form of descriptive statistical data are displayed in Table 1.

Table 1. Descriptive Statistics

	N	Min	Max	Sum	Mean	Std. Dev
Pretest	44	45	65	2390	54	6.156006
Posttest	44	80	95	3825	80	4.065726

Based on the descriptive Statistics table above, shows that the implementation of learning by applying e-modules based on local food wisdom in the city of Palembang has an influence on students' collaboration skills in physics learning, especially on temperature and heat. results. This can be seen from the pretest results of 44 students, with an average of 54 with the highest score being 65 the lowest being 45, and a standard deviation of 6.156006. Meanwhile, the posttest score with 44 students obtained an average of 95 with the highest score being 95 and the lowest score being 80, and a standard deviation of 4.065726. From the data obtained, it can be seen that the average posttest score is higher than the pretest score. Thus, e-modules based on local food

wisdom in the city of Palembang can improve students' collaboration skills. This increase is in line with research conducted by Youssef (2021) and Cholis et al. (2020) states that e-modules based on local wisdom can improve students' collaboration skills.

Table 2. Normality Test Results

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistics	df	Sig.	Statistics	df	Sig.
Collaboration Pretest	.203	44	.000	.893	44	.001
Collaboration Posttest	.229	44	.000	.866	44	.000

Before carrying out the next test which aims to determine the significant difference between the pretest and posttest averages, the research data is first tested for normality requirements to determine whether the

distribution of the data is normal or not. This is to find out and prove whether the empirical data obtained has a normal distribution or not (Widana 2020). The normality test results are presented in the table 2.

Based on the sig value. in the table, Shapiro Wilk shows the sig value. for the pretest, it has a value of 0.001 while for the sig. posttest shows a value of 0.000. Based on the decision-making criteria the sig value. less than 0.05 then the data is declared not normally distributed. So it can be concluded that the research pretest and posttest data are not normally distributed. Because the prerequisite test for normality shows that the data is not normal, it cannot be tested using the t-test. Next, a hypothesis test is carried out using non-parametric hypothesis testing. The non-parametric test used is the Wilcoxon test. The Wilcoxon test results can be seen in Tables 3 and 4.

Table 3. Wilcoxon Rank Test Results

		N	Mean Rank	Sum of Ranks
Collaboration posttest - Collaboration pretest	Negative Ranks	0a	.00	.00
	Positive Ranks	44b	22.50	990.00
	Ties	0c		
	Total	44		

- a. collaboration posttest < collaboration pretest
- b. collaboration posttest > collaboration pretest
- c. collaboration posttest = collaboration pretest

In Table 3 there are negative ranks and positive ranks. Negative ranks describe whether there is a decrease or not from the pretest and posttest data. Meanwhile, positive rank describes whether there is an increase or not from the pretest and posttest. Based on this table, it can be seen that in negative ranks no data has decreased and in positive ranks, 44 data has increased. This shows that all pretest data before implementing learning using the e-module based on local food wisdom in Palembang City experienced an increase during the posttest after implementing the e-module in learning.

Table 4. Wilcoxon Statistics Results

	Collaboration Posttest - Collaboration Pretest
Z	-5.897b
Asymp. Sig. (2-tailed)	.000

Table 4 is a non-parametric hypothesis test on students' post-test results. Based on the test results, the negative Z value is (-5.897), which shows that the post-test value is greater than the pre-test. The results of the Wilcoxon statistical test show the asymp value. sig (2-tailed) 0.000 which means the value is smaller than $\alpha = 0.05$. Because of the sign value. (2-tailed) $< \alpha = 0.05$, then the hypothesis that the e-module based on local food

wisdom in the city of Palembang can improve students' collaboration skills can be accepted. These results show that there is a significant influence on students in the learning process using e-modules based on local food wisdom in the city of Palembang on temperature and heat material.

These results are supported by the results of the n-gain test analysis shown in Table 5. The n-gain test was carried out to determine the increase in students' collaboration skills as seen from the difference between the test results before being treated and the test results after being given treatment. The average n-gain for collaboration skills can be seen in Table 5.

Table 5. Collaboration Skills Before and After Treatment and N-gain for Each Aspect

Aspect	N	Pre	Post	N-gain
Contribution		59.09	98.18	0.83
Time Management		55.11	88.64	0.75
Solution to problem	44	50	77.27	0.55
Work with other people		61.93	90.34	0.75
Research Techniques		61.36	89.77	0.74
Average		57.5	88.84	0.72

Table 5 shows that there is an increase in the average collaboration skills for all indicators. The first indicator, namely contribution, increased by 34.09%

with an N-gain of 0.85 entering the high effectiveness category. The second indicator, namely time management, experienced an increase of 33.52% with an N-gain value of 0.75 in the high category. The third indicator, namely problem solving, experienced an increase of 27.27% with an N-gain of 0.55 in the medium category. by previous research, the fourth indicator, namely working with other people, experienced an increase of 28.41% with an n-gain of 0.75 in the high category. The fifth indicator, namely investigative techniques, experienced an average increase of 28.41% with an N-gain value of 0.74 in the high category. Overall, the average collaborative skills of students increased by 31.34% with an N-gain of 0.72 in the high category or other words the physics e-module based on local wisdom, typical Palembang food to improve the collaboration skills of high school students quite effective for improving high school students' collaboration skills.

The highest N-gain value is in the first indicator, namely contribution, while the lowest increase is in the third indicator, namely problem-solving. This corresponds to the psychological development phase of adolescents, in this case, high school students who are in this phase tend to force things according to what they expect/want (Ajhuri, 2019). So when faced with a situation that requires working in a group, they will also tend to prefer being listened to/expressing opinions compared to listening to other people's opinions. Even though their ability to be a listener is quite good compared to their ability to provide ideas even when they are not working in a group (Wiyono et al., 2022).

The problem-solving indicator is relatively low compared to other indicators. This is due to several important reasons related to team dynamics and the group learning process. Findings in the field show that in collaboration, responsibility for finding solutions is often divided among team members. This means that no one person completely solves a problem on their own, so the value of individual problem-solving may seem less prominent. Instead, individual contributions to the collaborative process, such as sharing ideas, listening, and supporting other team members, become more important. Then in group activities, the final result is often the product of a collective contribution, not the result of a single individual. This makes assessing an individual's problem-solving abilities less relevant because the resulting solution is the result of the interaction and integration of various ideas and approaches from all team members. However, the results still show good things, in collaborating students develop skills working in teams and prepare them for real-world situations where problem-solving is often a joint effort (Lubis et al., 2022).

Overall, the increase in the N-gain score in each category of collaboration skills in Table 6 is due to the implementation of learning using e-modules based on interesting local food wisdom in the city of Palembang, so that students are enthusiastic in the learning process. This is in line with previous research conducted by Maulida et al. (2021) which shows that the use of teaching materials based on local wisdom can arouse students' motivation, involvement, and interest in learning. Integrating physics learning based on local wisdom can improve students' collaboration abilities (Cholis & Yulianti, 2020). This creates a more productive, dynamic learning environment and can improve overall learning outcomes, although individual contributions to problem-solving may be less prominent than contributions to the collaborative process. The stimuli given by teachers in e-modules require students to be active in collaborating so that the implementation of learning using e-modules can improve students' collaboration skills (Jufriadi et al., 2022). Research results prove that e-modules provide a positive experience for students in terms of the quality of the content, material, and media appearance presented (Martini et al., 2021).

Improving collaboration skills is also influenced by various activities that have been designed, one of which is the availability of a group discussion form for solving problems, there are practice questions to be done in groups, and a project at the end of the learning activity. This activity is carried out to hone students' skills in collaborating in making decisions, solving problems, and providing opportunities for students to work within an agreed period in producing products (Fitriani, 2020; Safarini, 2019; Waluyo & Wahyuni, 2021; Wiyono et al., 2022). Students collaborate when they work in groups or pairs to discuss a problem, solve a problem, or create a product (Safarini, 2019). It was found that during the implementation students worked together in groups to discuss the topics of their assignments, create an implementation calendar, and create a product or conclusion at the end. Collaboration skills like this are certainly important as skills that students need to work productively in teams in today's interconnected world of work and global society (Partnership for 21st Century Skills, 2008).

The context of local food wisdom in the city of Palembang becomes very relevant to students' lives, thereby encouraging learning from each other, which can increase the understanding and abilities of all team members. Integrating local food wisdom in the city of Palembang allows students to engage in discussions and use scientific evidence for decision-making in a socio-scientific context (Aswirna et al., 2022; Setiyani et al., 2022). When collaborating, students have the opportunity to broaden their horizons, conceptual knowledge, and environmental literacy through

discussion and feedback from peers, which is very rare if they work alone (Lubis et al., 2022). Students will motivate each other to complete group assignments, provide opportunities to conduct investigations, and create good communication and social collaboration skills in students (Bintang et al., 2020). Thus, the implementation of learning using wisdom-based e-modules has a positive impact on students' collaboration skills (Haruna et al., 2021).

Conclusion

The implementation of local wisdom-based e-modules for Palembang city food can be used to improve students' collaboration skills, as shown by the increase in the average value of students' skills before and after implementing local wisdom-based e-modules then local wisdom-based e-modules are effective for improving skills student collaboration, shown by the difference in the average N-Gain of students' collaboration skills after learning using local wisdom-based e-modules of 0.72 in the high category.

Author Contributions

Conceptualization, H. N, K. W, I. S.; methodology, H. N, K. W, I. S.; validation, K.W and I. S.; formal analysis, H. N.; investigation, H. N.; resources, H. N.; data curation, H. N.; writing – original draft preparation, H. N.; writing – review and editing, H. N, K. W, I. S.; visualization, H. N. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest

The author declares that there is no conflict of interest regarding the writing and publication of this paper.

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