INNOVATIVE LEARNING MEDIA THROUGH ETHNO-STEM INTEGRATION FOR SALT CRYSTALLIZATION CONTENT IN CHEMISTRY LEARNING

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ABSTRACT

Learning chemistry often causes misconceptions in its application. The misconception is caused by the lack of application of chemistry in daily life and the high difficulty in understanding chemical concepts. One solution to providing understanding related to chemistry learning is through learning media that can take advantage of the potential of local wisdom. One of them is local salt. Method research is development research with a Research and Development (RnD) model, which also integrates the STEM (Science, Technology, Engineering, and Mathematics) approach. This research aims to develop a learning media website based on local wisdom by utilizing local salt as a presentation in learning resources. The research results are in the form of adding web features related to materials or the need for teaching materials from local salt. The quality of web design on ethnoscience-oriented learning media websites with the topic of salt crystallization was seen based on the validity test of media experts (86.66%), the responses of students and chemistry teachers as respondents (86.66% and 89.38%). Overall, the results are categorized as valid and do not need to be revised.

Keywords: Chemistry, Education, Ethnoscience, Salt Crystallization

INTRODUCTION

Learning media is needed in the student learning process and helps teachers in the teaching and learning process in the classroom. The positive contributions that occur include students having a higher interest in the learning process, students being more interested in learning, learning concepts being clearer, and of course, saving teachers time in learning in the classroom (Umam, 2019). The use of media in the student learning process also provides freedom of thought and understanding of learning concepts. Students can understand the meaning of the learning topic without

changing its main principles. So that learning activities are participatory, collaborative, and interactive and do not experience missed conceptions (Wahyu et al., 2020). According to Arsyad in Panjaitan (2017), learning media is something that can transmit information that has instructional purposes.

During the rapid development of science and technology (IPTEK), the use of media in the implementation of learning is also always associated with technology. Something can be said to be a learning medium if it contains a symbol system, the application of technology, and the scope of learning topics (Wahyu et al., 2020). In addition, visual media is also required to be attractive so that students can understand it well. This will certainly have an impact on education and will experience a great discontinuation, the role and presence of teachers will also be increasingly challenging and require very high creativity to provide learning (Subakti et al., 2021). Especially for science learning in chemistry which is still considered abstract and difficult to understand for students (Kiswanto et al., 2024).

The application of chemical materials often experiences a misconception because it is abstract. Misconception certainly needs to be corrected with the existence of learning media (Nopriawan Berkat Asi, 2016). Based on research conducted by (Azzachra, n.d.) High school students studying chemistry are more interested in a website-based and local wisdom-oriented digital science learning system. The selection of web-based digital media is to reduce the limitations felt by students and teachers in terms of facilities and infrastructure. Where the use of the website does not take up much mobile phone memory capacity and can be accessed easily. Meanwhile, local wisdom is a science learning system by understanding the environment and related to understanding science based on customs, customs, and the nature of a certain area (Umam, 2019).

The application of web-based learning media oriented to local wisdom has many positive impacts on the chemistry learning system. Where students will better understand the concept of chemistry science well (Sulistiawati & Azizah, 2019). Chemistry learning based on local wisdom is rooted in culture obtained by utilizing the local potential of the region. The local potential of the region that has great potential to be used as a source of learning is salt because salt is a commodity that is often found in the community. In addition to being used for public consumption, salt is also used in the industrial sector as an additive, ranging from the food and beverage industry to the chlorine and alkali chemical industry. Therefore, to introduce culture and develop the local potential of the region, chemistry learning based on local wisdom is needed, especially for chemistry teachers to be used as a learning medium for students.

The use of interactive and student-based learning media also affects the improvement of students' science literacy (Hasanah et al., 2021). Learning with local wisdom is very important for students because learning

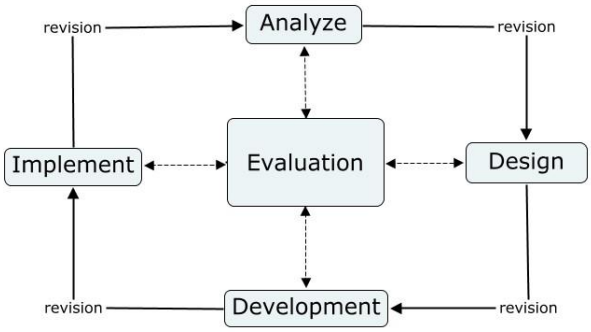
local wisdom can provide a connection between science and technology so that it is useful and close to life (Kiswanto et al., 2024). Therefore, there needs to be an integration between learning that can keep up with the development of the current era.

Today's education must adapt to the era of globalization through learning that integrates STEM *(Science, Technology, Engineering, and Mathematics)* (Zahirah & Sulistina, 2023). A comprehensive way to apply the four disciplines is to integrate them into learning methods. Learning with a STEM approach is a step for students to be able to provide opportunities for students to explore ideas, develop products, and develop further planning skills (Azis et al., 2019). Based on research conducted (Widya et al., 2019) Through learning with a STEM approach, students are trained to become individuals who can handle problems and learn new things, produce creative solutions, and become individuals who can manage themselves *(self-reliant)*, able to think logically, and become a person who is literate about technology. So the results of learning Chemistry with the Salt Crystallization sub-material through Learning Media with a STEM Approach will support 21st-century learning.

METHOD

In this study, the type of research used is research *Research and Development (R&D).* Development research is research used to produce a specific product by testing the feasibility of the product (Sugiyono, 2018). In this research, a product will be developed and produced, namely a Local Wisdom-Based Website Learning Media on the topic of Salt Crystallization. This study is designed as a research *Research and Development (R&D)* with ADDIE's development design. ADDIE consists of 5 main phases or stages, namely Analysis, Design, Development, Implementation, and Evaluation. The concept of ADDIE can be seen in the following image:

Figure 1:
ADDIE Model



The research was conducted in the nearest Chemistry Education Study Program and High School. Where the nearest potential for local

wisdom is the potential for local salt. The subjects of this study are 3 science teachers at the high school level and 15 grade XI students with 5 male students and 10 female students. The selected respondents were used as research subjects to support the validity of the data that had been collected as well as a benchmark between teacher data and student data.

The development procedure is by the development method used, namely ADDIE. These steps are used by researchers as a guideline for conducting research. The details of the development procedure with the ADDIE development method:

1. Analyze

At the analysis stage, the main focus is to understand the learning needs related to salt making using local wisdom and STEM approaches. Activities carried out include:

a. Collect data through surveys and interviews with teachers, students, and local wisdom experts to determine what aspects need to be taught in the salt-making process.
b. Assess learners' characteristics, including age, level of education, and prior knowledge of salt making and relevant STEM concepts.
c. Understand the environmental conditions where salt is made, such as available natural resources and local technologies used.
d. Formulate learning objectives to be achieved, for example, students can understand the crystallization process in salt making and relate it to STEM principles

2. Design

The design stage involves planning and designing the structure and content of the learning media. The steps include:

a. Develop materials that cover main topics and subtopics related to salt making, such as the crystallization process, and the use of traditional tools.
b. Choose effective learning methods, such as project-based learning where students conduct salt-making experiments, group discussions, and presentations of project results.
c. Create initial designs of learning materials, such as written modules, videos documenting the traditional salt-making process, and infographics explaining relevant STEM concepts.
d. Design evaluation tools such as quizzes, tests, and project assessments to measure the achievement of learning objectives.

3. Development

The development stage involves the creation and production of content and learning media based on a pre-planned design. Activities carried out include:

a. Write written materials describing the steps of making salt, produce videos showing the process, and create infographics explaining the scientific principles behind it.

b. Develop physical or digital learning tools, such as tools and materials for salt-making experiments.
c. Conduct a trial of learning media on a small group of students to get feedback and make necessary revisions.

4. Implementation

The implementation stage is the application of learning media that has been developed into a real learning environment. The steps include:

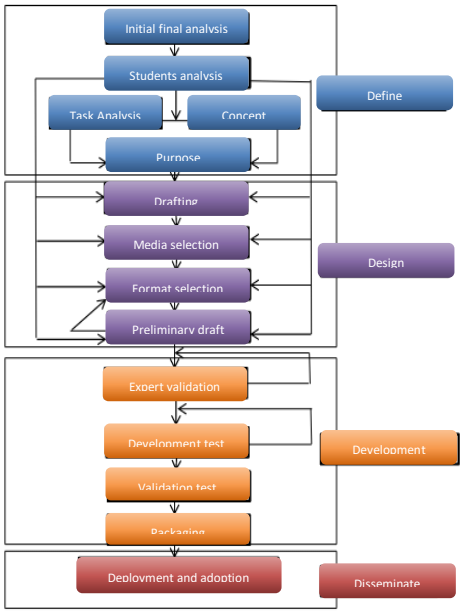
a. Train teachers or educators in using learning media that have been developed through workshops and training.
b. Implementing learning media in the classroom with teacher guidance, involving students in experiments and salt-making projects.
c. Monitor implementation and make adjustments based on feedback from students and teachers to ensure the learning process runs effectively.

5. Evaluation

The evaluation stage involves an assessment to measure the effectiveness of learning media and the achievement of learning objectives. These include:

a. It is done during the learning process to provide continuous feedback and allow for necessary adjustments. Involves quizzes, ongoing tests, and feedback from students and teachers.
b. It is carried out at the end of learning to assess the achievement of the overall learning objectives. It involves the final assessment of the salt making project, the analysis of learning outcomes, and the review for future improvement of learning media.

Figure 2:
Research procedure



Interviews and questionnaire distribution were carried out in the data collection technique. Interviews were conducted offline to research subjects to find out the need for websites that are oriented to local wisdom. The distribution of the questionnaire is carried out as a form of submitting written questions through a list of questions that have been prepared and must be filled in by the research subject. This questionnaire can also be called a questionnaire. The questionnaire was distributed to respondents or research subjects.

Data analysis techniques are carried out to analyze the results that have been obtained. The data analysis techniques used depend on the purpose of the research. The data analysis technique used in this study is through a validity test by validators or media experts. The total number of validation scores is then calculated as a percentage with the following formula:

$$Score\ (\%) = \frac{Number\ of\ Valid.\ Component\ Scores}{Maximal\ Score\ (15)}\ X\ 100\% = final\ score$$

After that, the score (%) that has been generated is converted in the form of a criteria table. The criteria for media validity can be seen in the following table 1:

Table 1:
Website validity criteria

No	Validity Criteria	Validity Level
1	85,01% - 100%	Highly valid or usable without revision
2	70,01% – 85%	Valid enough or usable but needs minor revisions
3	50,01% – 70%	Less valid, it is recommended not to be used because it needs a major revision
4	1% - 50%	Invalid or unusable

The data obtained through the questionnaire to the responses to the use of the website in the students the formula used to calculate the percentage is as follows:

$$Score\ (\%) = x\ \frac{Score\ Obtained}{Maximal\ Score\ (22)} 100\% = final\ score$$

After that, the score (%) that has been generated is converted in the form of a criteria table. The criteria for media validity can be seen in the following table 2:

Table 2:
Guidelines for Assessing Respondent Response Questionnaires.

No	Score Range	Category
1	86% – 100%	Excellent
2	76% – 85%	Good
3	56% – 75%	Enough
4	55% - 59%	Less
5	0% - 54%	Less than once

FINDINGS AND DISCUSSION

The development carried out to produce products in the form of web-based learning media with an orientation to local wisdom that discusses the topic of salt crystallization is presented in the form of a web that can be opened on a smartphone or laptop/PC. This media presents material on the topic of salt crystallization. Expert validation on learning media consists of 3 aspects of data obtained from the results of the trial of the Local Wisdom-Based Website learning media on the topic of Salt Crystallization in the form of assessments or validation results from media experts with a percentage of 86.66% or very valid. Media validation is carried out by media experts who have a background in the IT field. Validators are lecturers in the field of learning media and experts in the field of IT. The aspects assessed by the validator are the presentation of the website, the feasibility of the graphics, and the quality of the display. The results of media validation by validators can be seen in the following table 3:

Table 3:
Media Validation

No	Component	V1	V2	V3	Percentage (%)	Criterion
1.	Website presentation	4	4	4	86	Highly valid
2.	Qualification of graffiti	4	5	5	90	Highly valid
3.	Display quality	5	4	5	90	Highly valid
	Sum	13	13	14		
	Percentage (%)	86,6	86.6	90		
	Criterion	Highly valid	Highly valid	Highly valid		

Based on Table 3, the overall average result in media validation was 86.66%. Referring to Table 1 regarding the criteria for website validity, this media validation is declared very valid.

The next stage is the trial of media products developed through the small group trial stage. The implementation of this small group trial was carried out on 3 science teachers and 15 high school students, namely 5

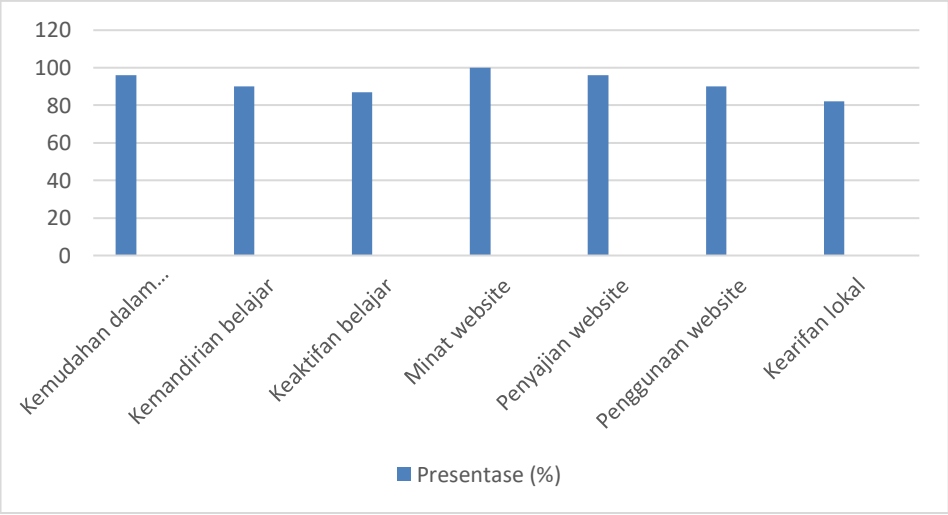
male students and 10 female students. The purpose of this trial is to see the level of attractiveness in the presentation of media and the practicality of the media. The results of the questionnaire can be seen in the following table 4:

Table 4:
Results of Respondent Response Questionnaire

No	Aspects	% Score	Category
1	Ease of understanding	96	Excellent
2	Learning independence	90	Excellent
3	Active learning	87	Excellent
4	Website interest	100	Excellent
5	Website presentation	96	Excellent
6	Use of the website	90	Excellent
7	Local wisdom	82	Good

Based on Table 4, it can be seen that the overall percentage of the existing assessment aspects is categorized as very good with an average percentage of 91.57%. The calculation of the score of science teachers is 89.38% and students are 86.96%. The lowest percentage is the aspect of local wisdom with a percentage of 82%. This is because some respondents still do not know about the potential of local wisdom or its relationship with salt crystallization learning. This development research does not continue to disseminate so it is not optimal in understanding local wisdom.

Figure 3:
Recapitulation of Respondent Response Results



Referring to Table 2 related to the respondents' response guidelines, the percentage results are categorized as very good. As for the assessment aspect of local wisdom, it is categorized as good. So overall, the respondents' response to this learning media has been good, the percentage of local

wisdom is low compared to other indicators because the content of local wisdom in learning is still unfamiliar so it needs to be adjusted in learning with the relationship of local wisdom.

CONCLUSION

Based on the results of the research that has been carried out, it can be concluded that:

1. The need for teaching materials that are on the characteristics of the subject is in the form of web-based showcase learning media that can be easily explored by students.
2. The implementation of chemistry learning in daily life can be done with an approach based on local wisdom (ethnoscience) by utilizing the local potential of coastal areas.
3. The quality of learning media oriented to local wisdom with salt crystallization material can be seen based on validity tests by media experts and responses/responses from teachers and students, namely media experts at 86.66%, teachers and students at 86.96% and 89.38%. So it can be categorized that the Website Learning Media Based on Local Wisdom on the topic of Salt Crystallization is suitable for use as a means of learning.

ACKNOWLEDGEMENT

Allow me to express my deep gratitude for the opportunity to lead this research project as Author 1. In this role, I have been involved in data collection, analysis, and meticulous manuscript preparation. This journey has been truly rewarding, and I am immensely thankful for the support and guidance provided by my co-author, Alya Dwi Arianty, and our lecturer, Mrs. Fitria Fatichatul Hidayah. Author 2's collaborative expertise has been instrumental in shaping our experimental design and interpreting our data. I also extend my thanks to Author 3, our lecturer Mrs. Fitria, for her sincere guidance and valuable feedback throughout the writing process. Their contributions have significantly contributed to refining this manuscript and enhancing its academic impact. This research stands as a testament to our collective best efforts and dedication.

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