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Development of Interactive Multimedia to Foster Students' Information Literacy Ability on Salt Hydrolysis Topic

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Abstract
This study aims to produce and determine the feasibility of interactive multimedia salt hydrolysis to grow students' information literacy skills. This research is a development research which includes 10 stages of implementation, namely potential and problems, collecting information, product design, design validation, design revision, product trial, product revision, usage trial, product revision, and bulk product. However, this study only reached the stage of product revision. The interactive multimedia produced was then validated by 2 expert lecturers in the field of chemistry education, and for practitioner tests by 1 chemistry teacher and then a limited group trial was carried out involving 15 students of senior high school (SMA) Negeri 1 Batulayar. Based on the assessment of two lecturers as validators getting an average of 91,2% with a very decent category, the practitioner test results got a percentage of 94.3% with a very decent category, and the results of a limited group trial by 15 students got an average percentage of assessments for ease, readability, display, material, and motivation of 88.6% with good categories. So it can be concluded that the product of interactive multimedia development of salt hydrolysis has met the feasibility aspect and this medium can be used in learning on salt hydrolysis material.

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INTRODUCTION

Chemistry is a branch of science that looks at the nature and structure of matter, how matter changes, the rules and principles that describe how matter changes, and the ideas and theories that explain how matter changes (Apriyani & Dewi, 2015). The characteristics of chemistry are shown by chemical representations consisting of three levels, namely macroscopic, submicroscopic, and symbolic levels (Prayoga & Dewi, 2014). The macroscopic level consists of phenonemas that occur and can be seen directly (Citra Ayu Dewi & Ahmadi, 2014). The sub-microscopic level contains particle levels that can be used to describe particulates of a chemical phenomenon such as the movement of electrons, molecules and atoms (Ahmadi & Dewi, 2014). The symbolic level contains representations and chemical phenomena using signs, images, algebra, chemical equations and forms of calculation (Dewi et al., 2022).

One of the chemical materials that is abstract and considered difficult by most students is salt hydrolysis material. The concepts of salt hydrolysis material that are abstract must be understood by students in a limited time make it a material that is still difficult for most students, so many have not succeeded in learning it (Sya'idah et al., 2020). Therefore, to explain the abstractness and complexity of the salt hydrolysis material can be helped by

learning models and supporting teaching materials (Khaldun, Hanum, & Utami, 2019). Based on the results of interviews with chemistry teachers at Senior High School (SMA) Negeri 1 Batulayar, information was obtained that chemistry concepts are not only difficult for students but also difficult to teach by teachers. This difficulty has to do with the chemical characteristics themselves. The limitations of learning media in learning activities are also one of the difficulties of teachers in delivering chemical material, while the chemical material that students must receive is so complicated. In general, students tend to learn by rote rather than actively understanding chemical concepts. From these problems, it has an impact on low student learning outcomes, namely the learning outcomes obtained by most students do not reach the minimum completeness criteria and the completeness of student learning in the classroom does not reach the classical completeness criteria (85%). A class is said to be complete learning (classical completeness) if there are more than 85% in the class (Dewi, 2019). Student weakness occurs in such schools is the lack of students' ability to manage formulas, students' understanding of concepts is lacking because they just memorize without understanding them (Dewi et al., 2022). This is due to the lack of information literacy skills of students (Dewi et al., 2022).

The cause that is a factor in the weak information literacy ability of students is that the learning resources used are only in the form of textbooks and the teaching and learning process in schools is still teacher-centered (Dewi, Pahriah, & Purmadi, 2021). There needs to be things that can aid the teaching and learning process in the classroom, such as learning media that can make it easier for students to understand the learning material, because otherwise the learning outcomes will be almost identical if the material is taught using the same method (Dewi et al., 2022). Students' attention can be captured and their interest and motivation for learning can be stimulated through the use of media (Dewi, Pahriah, & Gazali, 2020). Media is anything that can be utilized to convey a message to an audience and pique that audience's interest, curiosity, and ultimately, learning (Muliani, Khaeruman, & Dewi, 2019). Learning media is expected to cause learning activities that are interesting, fun but still have a seriousness in learning so that they can train students' higher-order thinking skills (Rizkiyansyah, Khery, & Dewi, 2018) & (Aprilian, Muhali, & Dewi, 2018).

Therefore, it is essential to have learning media, specifically interactive multimedia, to support the learning process for it to be effective. Multimedia that can be controlled by the user, allowing them to make decisions about what happens next, is called "interactive" (Dewi & Hulyadi, 2015). The fact that individual pupils can make use of this multimedia resource is one of its many benefits (Rohanawati, Suryati, & Dewi, 2014). Therefore, in order to improve students' ability to find and use knowledge, it is important to provide them with engaging learning materials that can help them picture key concepts through text, animation, video, and fascinating visuals (Dewi et al., 2021). Students need to have a high level of information literacy (Dewi, 2013). Students that are well-versed in the use of available resources will have no trouble excelling in this mode of instruction (Dewi, 2013b). However, due to existing issues, students find it challenging to study at home (Kurnia et al., 2022). Even if the typical high school student is proficient with the technology available (Dewi et al., 2022). Therefore, it is important to work toward increasing pupils' information literacy.

Information literacy is able to empower students to be able to learn independently and continuously, able to recognize the information needed, able to search and able to understand the search strategy, have the ability to evaluate, utilize, communicate it and produce a new information product. According to Dewi et al., 2022 critical thinking skills, such as awareness, collection, understanding, analysis, synthesis, and use of information, as well as students' attitudes towards information treatment, tend to be hindered by a lack of information literacy at the university level. Several processes must be completed to achieve information literacy (Wu, Zhou, Li, & Chen, 2022). The Information Literacy Model

organizes these measures into a framework through which the skills of information literacy can be acquired (Avcı & Ergün, 2022). The development of technology is very influential on the development of various forms and types of information that exist (Kim, Vicentini, & Belland, 2022). So we are required to be able to obtain information not only written or printed materials, but from all forms and formats of information such as computers, films, posters, images, divisions, networks and others (Černý & Potančok, 2023). To anticipate the complexity of the information format, in addition to information literacy capable as basic literacy, it must also be able to as other literacy that will facilitate the information literacy process (Dewi et al., 2022).

Therefore, it is important to have a learning medium that can help students develop their information literacy skills while also capturing their interest and providing opportunities for active learning. This is in accordance with the statement conveyed by (Erna, Dewi, & Elfizar, 2021) that the given learning tools have the potential to enhance students' critical thinking skills, particularly in scientific disciplines. In this case, the need for interactive learning media has never been used by class teachers (Dewi et al., 2022). The learning materials created also need to be tailored to each individual student (Dewi & Ahmadi, 2014). Although the development time is considerable, it is hoped that this new form of learning media will enable students to better comprehend salt hydrolysis content and become more engaged in class than when teachers use learning media in the form of pictures only in the package book.

The term "learning video media" refers to any medium or group of components that may simultaneously show visuals and audio (Hayati, Armanto, & Zuraini, 2023). Interactive video media is a media that combines various text, images, sound, motion or animation that are interactive in connecting the learning media in its use (Auliah, Asrul, & Ramadhani, 2023). A learning media can be said to be interactive if there is involvement between students and the media, so that students do not just see or listen to the material in the media (Puji, Gulo, & Ibrahim, 2014). One of the important things in interactive video is the tools or means used in making media, namely mobile phones, for making video media to be developed (Mustika, Sugara, & Pratiwi, 2017). The media also provides advantages for individual learning, namely the position of all serving the learning needs of students, therefore the media used in learning must be efficient and effective and can be in accordance with the demands of students (Oktafiani, Nulhakim, & Alamsyah, 2020). Learning media that suit the needs of students are technology-based learning media, such as learning media in the form of interactive videos, namely interesting moving animation images and audiovisual simulations to attract student activeness and interest in learning (Widayat, Kasmui, & Sukaesih, 2014). The results showed that capcut media is suitable for use by teachers as a learning medium on the subject of animal motion organs with media expert validation of 87.5% (very valid), material experts 100% (very valid) (Rahmawati, Triwoelandari, & Nawawi, 2021). The development of interactive multimedia salt hydrolysis based on problem-based learning with adobe flash has been carried out by (Siregar & Sudrajat, 2018) the results of interactive multimedia development have met the feasibility aspect with a percentage of media expert validation of very valid.

Thus, it is important to conduct research on the development of audio-video learning media as Interactive Multimedia Chemistry Learning, especially the subject of salt hydrolysis to foster students' information literacy skills. This study aims to determine the characteristics and feasibility of interactive multimedia on salt hydrolysis material that has been developed. This interactive multimedia was developed using the help of macro power point, in which there are work steps for processing a material into useful product. In addition to containing material, this interactive multimedia also has practice questions, animations and videos so as to provide attraction for students to learn material contained in it. This interactive multimedia

can be accessed by students via laptops or smartphones1android offline, making it easier for students to access it.

METHOD

Research Design

Research and Development, the kind of study utilized here, is conducted in order to create and evaluate the efficacy of a product. In this study, researchers have developed a product in the form of learning media using a procedural model, which includes the stages of implementing research and development, namely potential and problems, collecting information, product design, design validation/interactive multimedia expert validation, design revision/evaluation and improvement, product trials/limited group trials, product revisions/evaluations and improvements (Sugiyono, 2015b). The research stage carried out in research and development is only up to the product revision stage because this development only tests the feasibility of media developed in schools and does not affect student learning outcomes.

Development Procedure

The research and development procedures in this study are as follows (Sugiyono, 2015a):

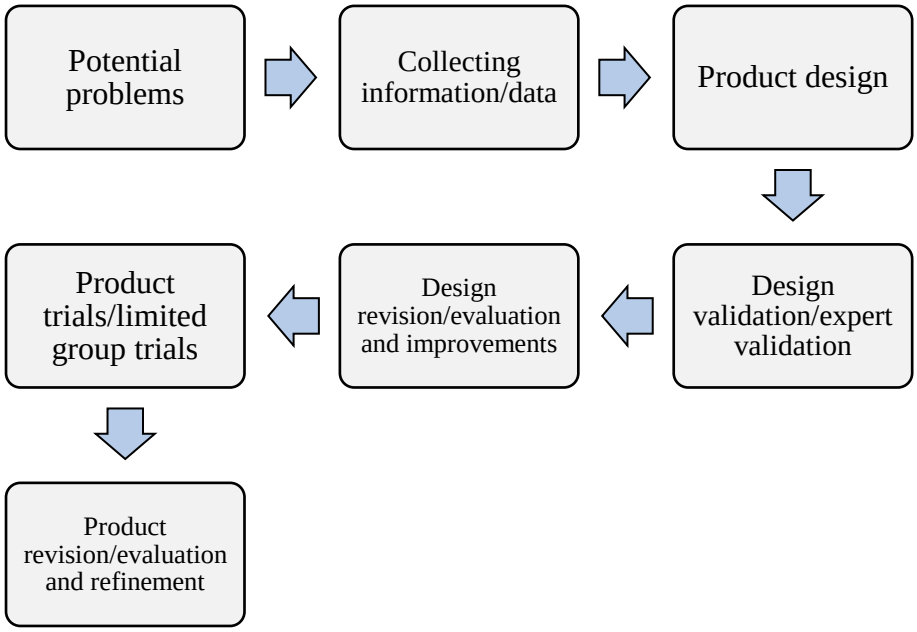


Figure 1. research and development procedures

Data Collection Instruments

Questionnaires were used as the data collection tool, with questions designed to elicit responses and test the viability of the created learning media, as well as solicit feedback and ideas for the interactive multimedia presentations of the salt hydrolysis content. The results of expert validation, practitioner validation, and small-scale trials were analyzed quantitatively and descriptively.

Data Analysis Techniques

This research for development makes use of descriptive analysis. The level of viability of the product generated as interactive multimedia on salt hydrolysis is established using the results of this descriptive analysis. Quantitative data in the form of descriptive percentages collected via questionnaires are included in the development's descriptive analysis. In order to gather

quantitative data, qualitative scales used in questionnaires must be transformed. Expert test questionnaires, practitioner trials, and small-scale trials all contributed quantitative data, which was examined using quantitative descriptive analytic methods. To calculate the percentage rate use the following formula (Sugiyono, 2015a):

$$P = \frac{\sum x}{\sum xi} \times 100\%$$

Information:
P = Large percentage
$\sum x$ = Total number of scores obtained from validators
$\sum x$= Maximum expected score

After knowing the percentage of the results of the questionnaire, then the achievement criteria are determined. The determination of the percentage result achievement criteria or eligibility achievement criteria is presented in table 1.

Table 1. Eligibility interpretation (Erna et al., 2021)

Eligibility percentage (%)	Interpretation
81,0-100	Very decent
61,0-80,9	Proper
41,0-60,9	Pretty decent
21,0-40,9	Not worth it
0,0-20,9	Very unworthy

RESULTS AND DISCUSSION

To obtain learning media in the form of interactive multimedia that meets the criteria suitable for use as teaching materials, researchers use the Research and Development (R&D) method, by following the development procedure according (Sugiyono, 2015b), which includes 10 stages of research and development implementation, namely potential and problems, collecting information, product design, design validation, product revision, mass products, but the stages of research carried out only reach the stage of revision poduk. Furthermore, researchers analyze the results of the media that has been developed. Interactive multimedia on salt hydrolysis material is made using power point macros and other supporting programs.

Potential and Problems

In this step, researchers determine the potential and identify problems that exist in the chemistry learning process in schools as well as learning media that have been developed by several previous researchers. The potential found is that the use of media in the learning process can attract students' attention and students' enthusiasm to learn, but the problem is that some learning media that have been developed, especially learning media in the form of software on salt hydrolysis material still have some shortcomings. Based on the analysis that has been done, researchers examine the basic problem in the form of difficulty in understanding the material because most of the chemistry is abstract material, lack of initial knowledge of students on the material faced in the learning process. Thus, it is necessary to develop a learning media that can help the learning process of students.

In this activity, the basic problems faced in chemistry learning are studied so that it is necessary to develop learning media in the form of software. At this stage, researchers observed the problems that arise in chemistry learning in class XI of SMA Negeri 1 Batulayar and these problems include during the learning process teachers tend to be more active because teachers prefer to use conventional methods and direct discussions which cause a lack of student motivation in the learning process, so that students' information literacy ability are not visible. Then the multicomplex characteristics of chemistry also make it

difficult for students to understand the materials in the science. Students also have trouble grasping the mathematical content of chemistry courses because of a lack of association between natural occurrences and everyday life. The aforementioned issues highlight the need for an interactive multimedia learning program, which has the potential to engage students in the learning process, increase their information literacy skills in a short amount of time, and cost less than traditional instructional methods. The issue is laid forth in the following table:

Table 2. Quantitative data from observations in schools

No	Measured variables	Number of Questions	Max Score	Total Score	%
1	General conditions in the classroom	1-22	1936	1223	63,17
2	Scientific Learning	23-26	352	217	61,647
3	Information Literacy	27-37	968	521	53,82

Product Design

In this step, researchers collect information that can be used as material for product planning that is expected to overcome the problem at hand. In this study, information collection in the form of literature studies and field studies. The results of the literature study conducted by the researcher are salt hydrolysis material contained in Basic Competencies (KD), in the K13 syllabus and curriculum data in schools. For the results of field studies conducted at SMA Negeri 1 Batulayar, this school still does not fully utilize interactive multimedia as a learning medium, causing chemistry teachers to only teach in a conventional way (without practicum or demonstration), with such learning causing students to feel bored and lack interest in learning chemistry and not a few of the students at the school think that chemistry subjects are eyes lessons that are difficult to understand, especially in salt hydrolysis which has several abstract concepts and understanding concepts that require practicum. Interactive multimedia is made using macro power points that can help students in the learning process so that the learning process in class is not boring. The results of this information collection are used as a basis for designing learning media products in the form of interactive multimedia salt hydrolysis.

Design Validation

In this step, the researcher designs the product in the form of a storyboard or sketch image arranged sequentially according to the script. The shape of the storyboard that has been made can be seen in figure 2. In this Storyboard there is a framework or sketch of the media to be developed such as the layout of menus, images, videos, and buttons that will be used in the development media then the components that will later be loaded on interactive multimedia development media. The components in this interactive multimedia development media are instructions, competencies, materials, and evaluations. After making the Storyboard the components that will be loaded on interactive multimedia development media, then the next step is making media using a power point program. The power point macro was used in the creation of this media.

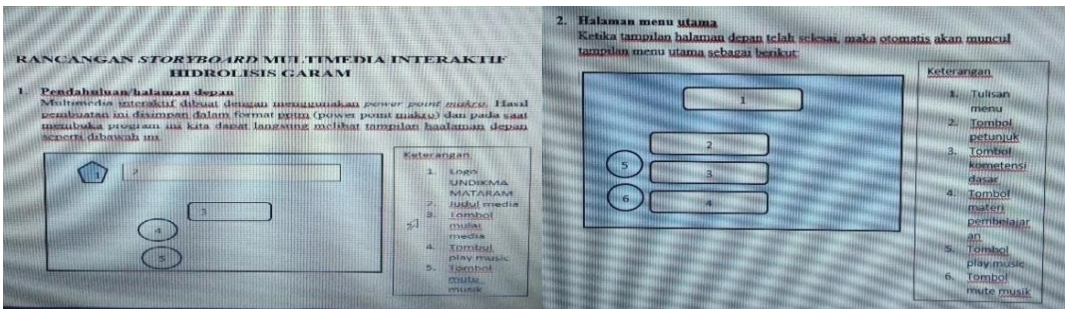
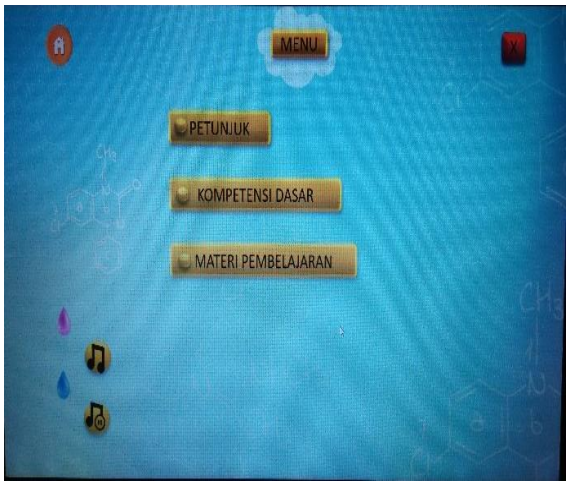


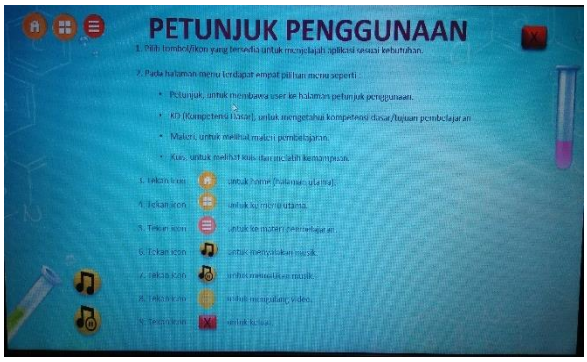
Figure 2. Storyboard

The interactive multimedia design that will be developed consists of several displays including (1) the opening display containing the UNDIKMA Mataram logo, (2) the main menu display is the initial display of the main opening program of learning media, the initial display of the program consists of a menu bar namely instructions, competencies, learning materials, home, and exit, (3) the display of material is divided into several sub menus, namely definition sub menus, concept, calculate pH, properties, and uses of salt hydrolysis as well as a quiz button that serves to allow users to access quizzes. In the quiz view, users can answer questions that can automatically move to the next question after answering and after answering the last question will automatically move to the assessment page which will show the final grade by pressing the assessment button first. Some examples of developed media displays can be seen in figure 3.

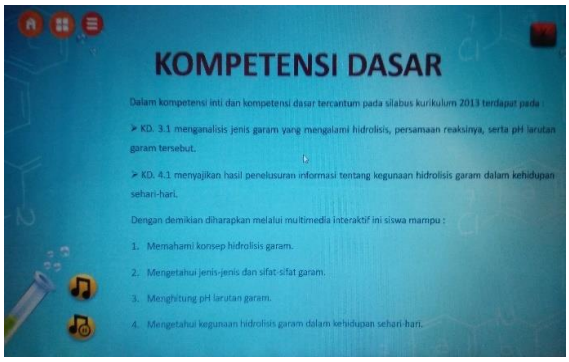
Opening view



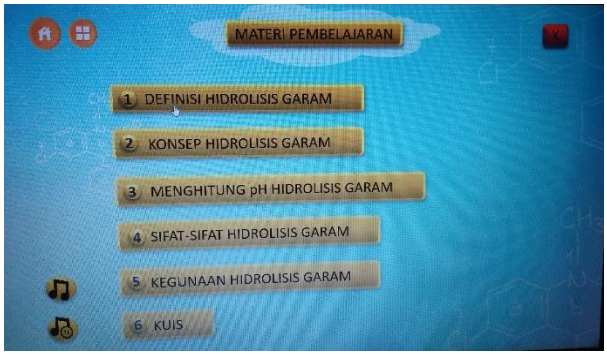
Main menu display



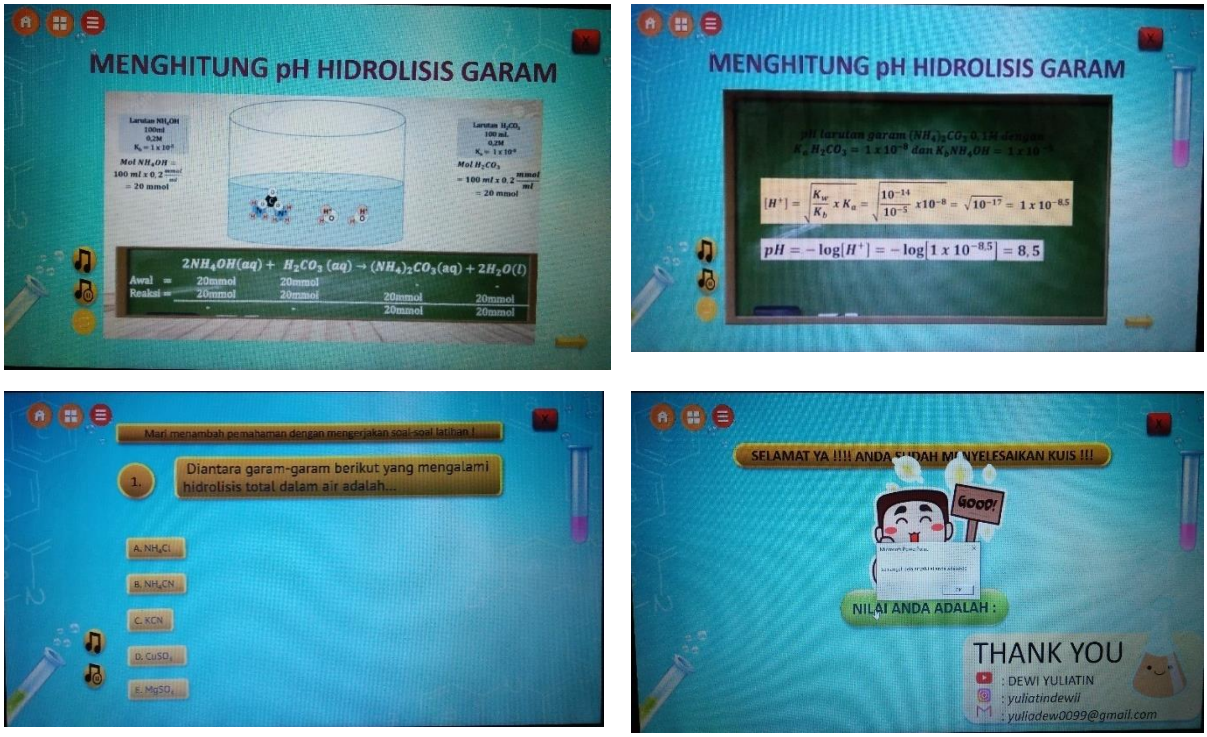
Display of hints



Competency view



Material display



Quiz view Score display

Figure 3. Examples of developed media displays

In this step, the resulting product will be tested by expert lecturers to obtain a feasible / valid product. The expert lecturer who became a validator was a chemistry lecturer at UNDIKMA Mataram. After the product is validated by two expert lecturers then the product is revised before being tested by practitioners and tested with a limited group. This validation is performed to check how well the product works. The quantitative and qualitative data acquired from this validation is used to determine the media's or product's viability, while the qualitative data obtained in the form of suggestions is utilized to enhance the media created. The following qualitative data from expert lecturers is presented.

Table 3. Quantitative data due diligence expert validation

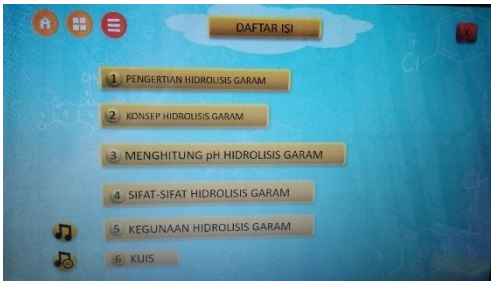
No	Validators	Eligibility percentage (%)	Description of validation
1	Validator 1	91,8	Very decent
2	Validator 2	90,6	Very decent
Eligibility percentage		91,2	Very decent

The results of the feasibility assessment by the first validator are shown in table 3 to be 91.8% (with extremely feasible criteria), while the results of the assessment by the second validator are shown to be 90.6%. In general, interactive multimedia learning media for salt hydrolysis has been declared very feasible by validators or expert lecturers, but there are several inputs/suggestions from each validator on the media/products developed. As for the input / suggestions from validators including the display of animated videos need to be a little tidied up again and there are some improvements to the buttons / navigation.

Product Revisions

Products that have been validated by expert lecturers are then revised according to input/suggestions from both expert lecturers. The improvements to the display are as follows:

a. An animated video display of salt hydrolysis material before and after revision can be seen in Figure 3 below.



Before revision

After revision

b. The display of animated video before and after revision can be seen in Figure 4 below.

Before revision

After revision

Limited trial of Interactive Multimedia

The interactive multimedia designed then tested on practitioner tests (chemistry teachers) and limited group trials at SMA Negeri 1 Batulayar. For the practitioner test, the product was assessed by the chemistry teacher and for the limited trial, the product was assessed by 15 students of class XI MIPA SMA Negeri 1 Batulayar.

Figure 3. Limited group test atmosphere of grade XI students of SMA Negeri 1 Batulayar

Based on quantitative and qualitative data, the results of product assessment by practitioner tests obtained a value of 94.4% with the category suitable for use as a learning medium. The results of the limited trial can be seen in the table below.

Table 4. Limited group trial assessment result data

No	Assessment aspect	Percentage (%)
1	Ease	86,6
2	Readability	90,8
3	Display	89,1
4	Material	89,4
5	Motivation	87,0
	Average assessment percentage	**88,6**

Based on research data from limited group trials, an average assessment percentage of 88.6% was obtained, so interactive multimedia products of salt hydrolysis can be used as a learning medium because from the results of the study the responses in limited groups were very good. Qualitative data, namely students provide varied and positive comments or responses to the interactive multimedia that was tested.

Product Revisions

The final stage carried out in this study is the revision of products that have been tested by practitioners and limited trials at SMA Negeri 1 Batulayar, which is then revised, revisions are carried out based on consideration of the results of filling out questionnaires at the practitioner test stage. Then consult the revision results with the supervisor. The revised result is the final product of interactive multimedia salt hydrolysis.

The development of interactive multimedia is carried out to overcome problems that are often experienced by students, especially in the chemistry learning process on salt hydrolysis material and problems experienced by some schools regarding the lack of use of multimedia as a learning medium in the school. Learning with interactive multimedia causes students to be more creative and innovative along with the times, and can improve higher-order thinking skills and grow students' information literacy skills (Dewi et al., 2022). In this interactive multimedia development research, students' information literacy skills are used as a reference in the process of making interactive multimedia salt hydrolysis, which can be seen through interactive multimedia salt hydrolysis is indirect observation, symbolic language, laws of cause and effect, and mathematical modeling. The interactive multimedia developed consists of materials, audio, images, videos, sample questions, and practice questions. Practitioner tests and small group trials informed the development of learning media in the form of software, specifically interactive multimedia, which will be used in the future as one of the learning media at SMA Negeri 1 Batulayar. The creation of interactive multimedia is intended to serve as a supplementary aid in the expansion of students' information literacy abilities in regards to salt hydrolysis content.

Student interest in the study's developed interactive learning media items can be inferred from their responses. This can be seen from the results of filling out the questionnaire sheet on each question indicator. Learning tools such as Interactive Power Point are popular with students and can be effectively integrated into the classroom. This is in accordance with research conducted by Annisa & Simbolon (2018) that the resulting media product is an interactive PowerPoint learning media based on guided inquiry that presents models in three levels of chemical representation with very high practicality categories. Apriani (2018), Research results were obtained, namely: (1) Analysis, design, development, implementation, and evaluation are the five phases that make up the product development process. Analysis of trial activities (needs assessment, expert review of materials, review of learning media designs, readability test, limited trials) confirm the product's validity; (2) 74% of students met the minimum completion criteria, indicating the product was effective; (3) students found the product engaging and easy to understand, suggesting the product was well received. Research conducted by Mashami & Khaeruman (2020), prove that the validity, practicability, and efficacy of PBL-based interactive multimedia development. Accraf, Suryati, & Khery (2018), The findings confirmed the validity and efficacy of the media for educational purposes.

CONCLUSION

The conclusion obtained in this study is that interactive multimedia chemistry has been successfully developed and declared very feasible to be used to foster student information literacy. The implication of this research is that the products of this research and development

can be widely used in chemistry learning. Chemistry interactive multimedia is a learning medium that specifically emphasizes interactive aspects, multi representation, and overall can hone students' information literacy skills.

RECOMMENDATIONS

The preparation of storyboards in this study takes longer than planned because many aspects must be integrated in one product. For other researchers, it is expected to really understand all these aspects to make it easier when compiling storyboards. Furthermore, interactive multimedia chemistry needs to be developed on other materials so that it can help students learn chemistry easily and enjoyably.

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