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Development of Website Learning Media (Mobirise) Based on Guided Discovery Learning on High School Chemistry Subjects

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Abstract: This study aims to develop website learning media (mobirise) based on guided discovery learning on high school chemistry subjects to increase students' understanding and interest in learning buffer solution material. This study used the research and development method with the ADDIE model, which includes five research stages: design, development, implementation, and evaluation. The data collection techniques in this study were interviews, validation sheets, and student response questionnaires. The data obtained were then analyzed qualitatively and quantitatively. The result showed that validation results by material experts and media experts with a percentage of 100% with category very valid. The results of the assessment of the three reviewers received an average score of 89.4, an ideal level of 89.4%, with a very good category. The results of 30 students' responses showed an average score of 92.3 and an ideal percentage of 92.3% with a very good category, so learning media based on guided discovery learning can be feasible for learning.

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Introduction

The rapid development of technology and information in the 21st century also develops all aspects of life, including education. The world of education must constantly adjust technological developments to improve the quality of education, especially the adjustment of its use in the learning process (Budiman, 2017). The development of information technology also impacts the learning process itself, including several shifts in the learning process. Where initially the learning process was only carried out in the classroom, changing tables be done anywhere and anytime, learning was only done using paper, changing to being to be done online, learning can only be done from physical facilities can now be done using the network (Jamun, 2018). Therefore, as learning agents, teachers must be able to master and apply information and communication technology in learning activities. The selection of learning media is also an important thing that must be considered because it will significantly affect students' understanding of the subject matter (Mulyani & Haliza, 2021).

Based on the results of interviews conducted with one of the high school chemistry teachers in Yogyakarta province, it is known that students are less motivated to learn because the learning media used are only chemistry textbooks and lecture methods in teaching. The teacher even said that 95% of students did not understand the chemistry subject matter taught, including the buffer solution material. Buffer solution material includes material that is difficult for students to understand. Research from Sariati in 2020 also stated that students had difficulty in explaining the importance of buffer solutions 42%, difficulty in

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distinguishing buffer solutions and non-buffer solutions 38%, difficulty in calculating the pH and pOH of buffer solutions by 44%, difficulty adding a little acid or base and dilution by 86%, difficulty in describing the function of buffer solutions in the body by 74% (Kadek & Nyoman, 2020). Based on the problems that occur in schools, it is necessary to make an effort to increase students' learning motivation in the learning process. One of the things that can be done is to choose and use appropriate learning media (Fadloli & Kusumo, 2019).

Websites are one of the more innovative learning media. The website is an innovation that has significantly transformed the learning process by allowing students to participate in activities such as reading, observing, asking questions, collecting data, and listening to the teacher explain the material (Ayu & Sari, 2021). One of the existing website builder platforms is Mobirise. Mobirise is a free website builder platform that is easy to create because there are templates on Mobirise. The reason for using Mobirise is that this website builder platform is minimally helpful as a learning media because it is generally used to create marketing websites. In addition, Mobirise has the advantage of being an interactive learning medium (Suryandaru & Setyaningtyas, 2021).

The development of website learning media on buffer solution material also uses a guided discovery learning model, which is one of the learning models that involves students actively in the learning process through learning steps that can stimulate students to search and discover something systematically based on the direction given by the teacher (Kartini & Bahar, 2021). Guided discovery learning has a role in helping students think logically and systematically, discover knowledge, and learn independently (Muhali et al., 2021). Guided discovery learning-based chemistry learning media can create a better learning setting where students show more motivation and improve learning outcomes (Nurhairunnisah et al., 2022).

Several studies related to guided discovery-based chemistry learning media have been conducted, including Yerimadesi and Azizah's research in 2021, which developed a learning media module based on guided discovery learning on electrolyte and non-electrolyte materials. The results of this study concluded that the learning media based on guided discovery learning that was developed was feasible to use and could improve student learning outcomes (Kristalia & Yerimadesi, 2021). In addition, research from Anita et al. in 2021 also developed a module based on guided discovery learning on stoichiometry material. This study concluded that the developed learning media based on guided discovery learning was also practical and effective for the learning process (Simangunsong & Pane, 2021). Therefore, this research aims to develop a website learning media (mobirise) based on guided discovery learning on high school chemistry subjects to make it easier for students to understand the material and increase student interest in learning.

Research Method

Research and development was used to produce and test a product's effectiveness (Rohma et al., 2022). This study used the research and Development (R&D) method with the ADDIE development model developed by Dick and Carry (Sari & Harjono, 2021). In the ADDIE development model, there are 5 stages, namely: analysis aspect aims to identify existing problems in learning; design helps design learning media in the form of a website; development is the process of assembling web pages to become a complete media unit that is ready to be tested, implement is done to test learning media on respondents and evaluate is done to determine the quality of the products produced (Wigunanto et al., 2020).

Assessment of development products using research instruments. The research instrument was a questionnaire given to material and media validators to get product

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validation on whether or not it is suitable for use (Puspita et al., 2017). The teacher gave a product test questionnaire to get an assessment and comments on the product. Product test questionnaires were given to students to get an assessment and comments on the product when used by students (Munawarah et al., 2021). The product was reviewed by peer reviewers, namely three chemistry education students of UIN Sunan Kalijaga to provide suggestions, validated by one material expert and one media expert, and assessed for quality by three reviewers, namely one chemistry teacher in each school (MA Babburroyyan Yogyakarta, SMA N 2 Banguntapan Yogyakarta and SMA N 1 Kasihan Bantul), and responded by thirty students of class XII MIPA SMA Negeri 1 Kasihan Bantul. The types of data obtained were quantitative data and qualitative data. Quantitative data is obtained from material and media experts' validation results (Herawati & Muhtadi, 2018). Qualitative data in the form of information on criticism and suggestions are also obtained from the results of validation by validators and the results of product trials, which can be used to improve the products developed to be better (Ani & Lazulva, 2020).

Data analysis techniques in this development research included product validation and quality assessment data. Product validation data is qualitative data containing suggestions and input from peer reviewers, material expert lecturers, media expert lecturers, and reviewers (high school chemistry teachers) for product improvement. Product quality assessment data about the quality of website learning media is obtained from material expert lecturers, media expert lecturers, and reviewers (high school chemistry teachers). Data from the assessment of material experts and media experts were analyzed to obtain the quality value of website learning media by looking at the product validity criteria in Table 1.

Table 1. Criteria for Product Validity

Percentage	Category
90%-100%	Very Valid
80%-89%	Valid
65%-79%	Fairly Valid
55%-64%	Less Valid
0%-54%	Invalid

(Aswardi et al., 2019)

To test the validity, an analysis with the format $\boldsymbol{P(s)}$ =cap S over cap N, %% with the information S: the number of scores obtained and N: the maximum (Putro & Setyadi, 2022). To convert the results of the product quality assessment from the reviewer (high school chemistry teacher) in the form of qualitative data into quantitative data with the provisions in Table 2.

Table 2. Assessment Categories

Category Value	Skor
Very Good	4
Good	3
Less	2
Very Less	1

(Anggorowati, 2020)

Meanwhile, to calculate the average of the reviewer's assessment (high school chemistry teacher) with the following provisions:

$$X = \frac{\Sigma X}{N} X = \frac{\Sigma X}{N} \quad \ldots\ldots(1)$$

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Description:
$\bar{X}$ = average score
Σx = number of scores
N = number of raters (Ibrahim et al., 2020)
Furthermore, to convert the average score into a quality value with ideal assessment criteria. The reference for converting scores into quantitative values can be seen in Table 3. Then, the percentage of product ideality as a whole and each aspect is calculated using formula (2).

Table 3. Score Conversion Reference

Score Range	Category
$x \geq \bar{x} + SBi$	Very Good
$\bar{x} + SBi > x \geq \bar{x}$	Good
$\bar{x} > x > \bar{x} - SBi$	Less
$x < \bar{x} - SBi$	Very Less

(Amin & Sulistiyono, 2021)

% ideality = $\frac{gain\ skor}{maximum\ skor} x\ 100\% \frac{gain\ skor}{maximum\ skor} x\ 100\%$ …..(2)
Analysis of student response data from qualitative data converted into quantitative data using the Guttman scale can be seen in Table 4. Then, the average value for all aspects is calculated using formula (1). Then, calculate the percentage of product ideality and each aspect using formula (2). Then, the data interpretation of the idealized percentage results in categories such as Table 5.

Table 4. Guttman Scale

Category	Skor
Yes (for positive statements)	1
No (for positive statements)	0
Yes (for negative statements)	0
No (for negative statements)	1

(Dwiningsih et al., 2018)

Table 5. Interpretation scale criteria

Percentage	Category
81%-100%	Very Good
61%-80%	Good
41%-60%	Enough
21%-40%	Less
0%-20%	Very Less

(Gustina et al., 2021)

Results and Discussion

This research produces a product in the form of a guided discovery learning-based website learning media that is suitable for use as a learning media for students so that it can overcome students' weaknesses in understanding buffer solution material. The steps are as follows:

Analysis

Researchers carry out this analysis stage to make observations and identify problems—the process of identifying problems through interviews with teachers. The analysis showed low student learning outcomes in buffer solution material, as evidenced by 24 students not completing the KKM. Learning buffer solutions so far is still limited to

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explaining concepts through lectures and illustrations through pictures on the blackboard. If you look at the problems described, it is necessary to have innovative learning media that supports students in learning buffer solution material. One learning medium by these conditions is a website based on guided discovery learning. The development of website-based learning media can be an alternative to interactive learning media to improve learning outcomes, interest, and student motivation (Panjaitan et al., 2022), especially in the chemistry subject of buffer solution material in class XI MIPA. Using website learning media is considered more effective and exciting and increases student learning motivation because students are encouraged to explore the knowledge they get through the website (Widianto, 2021). Guided discovery learning-based learning is where students can find/investigate a concept through the learning steps. By making a discovery, students are expected to increase their active role to increase their understanding of the learning process (Samudera et al., 2022).

Design

The design stage follows the guided discovery learning-based website learning media development procedure on buffer solution material. At this stage, researchers make prototypes of learning media, including preparing learning media frameworks, determining systematic content, collecting relevant material, and designing validation sheets and teacher and student response sheets (Pratama, 2021). The learning media framework is prepared to develop the proper learning media framework to be developed. Making this media refers to the syllabus and lesson plans. When preparing the lesson plan, it is necessary to prepare learning objectives that are suitable for students. This research uses buffer solutions as the subject matter. Next is to collect materials, images, videos, and audio that will be used. For the material itself, researchers took from books and other references. Images and videos are taken from a free web, and there are some that researchers make through the Canva and Animaker applications. After collecting the materials, researchers created a learning media website with mobile software.

Development

The development stage is where the design is made and realized in actual form (Giawa et al., 2022). At this stage of development, the media made using mobile software is consulted with the supervisor, and then the product is reviewed by three peer reviewers. After the product is revised based on suggestions and input from experts, it produces a revision I product. Then, the revised product was tested by a team of validators to validate the feasibility of the media and material. Material and media experts' suggestions and input were used as material for revision II and product improvement. Furthermore, three reviewers (high school chemistry teachers) assessed the revised product II. They responded to thirty high school students in class XI MIPA to obtain data and input for revision III as the final product. The final product of the developed media is a guided discovery learning-based mobirise website on buffer solution material, which can be accessed at the address https://penyanggaasyik22.mobirisesite.com/ through various devices (smartphones, laptops, or tablets) using the internet network.

Implementation

This implementation stage aims to ensure that teachers have prepared a good learning environment and engage students effectively in the learning process. This stage involves general procedures, including teacher and student preparation (Cahyadi, 2019). The implementation stage is the stage that applies the results of the learning media website mobirise based on guided discovery learning on the material of buffer solution into learning

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in one of the 11th-grade classes. The implementation stage includes trials for students to get student responses to the products developed and product quality assessment by reviewers of high school chemistry educators. By doing this implementation stage, it is expected that the learning media can be tested and evaluated by students and get an assessment from educators who are experts in the field of chemistry so that learning media products can be improved and refined according to the needs and expected quality standards.

Evaluation

This stage is the evaluation stage, where researchers process data to see the results of media validity, material validity, chemistry teacher reviews, and student responses to determine the specifications of the final product feasibility results after being implemented in the learning process. The validation results by material experts include two aspects with a percentage of 100% (Very Valid). Then, the validation results by media experts include three aspects with a percentage of 100% (Very Valid). The results of the validation of material experts and media experts can be seen in Table 6.

Table 6. Analysis of Validation Results

Validation	Aspects	∑ Indicator	Percentage			Total	Category
			VTR	VDR	TV		
Material Expert	Material	3	33,3%	66,7%	0%	100%	Very Valid
	Guided Discovery Learning	2	50%	50%	0%	100%	Very Valid
Ahli Media	Usability	3	33,3%	66,7%	0%	100%	Very Valid
	Settings	4	25%	75%	0%	100%	Very Valid
	Design	3	0%	100%	0%	100%	Very Valid

The validation results conducted by material experts are two aspects with five indicator items, including novelty, depth of material, language, the content of guided discovery learning on the media, and presentation of guided discovery learning on the media. The results of validation by material experts fall into the very valid category. This is due to the content and text of the material, the suitability of the material with KD, indicators and learning objectives, and the use of appropriate language. The presentation of material on the media was developed and arranged following the syllabus, KD, and indicators per the learning objectives to be achieved. The linkage between essential competencies, indicators, learning objectives, learning content guided discovery learning on the media and presentation of guided discovery learning on the media following the learning objectives contained in the media to facilitate students and teachers in the learning process so that learning objectives can be achieved to the maximum to improve the quality of a lesson (Siddiq et al., 2020). This is in line with the findings of previous research, which states that in making learning media, it is vital to pay attention to the suitability of learning objectives, indicators, essential competencies, and learning materials that students must achieve (Geni et al., 2020). Based on this, it can be concluded that the relationship between indicators, essential competencies, learning objectives, and learning content is needed to facilitate the learning process and improve the quality of learning.

The results of media validation have three aspects, with 10 indicator items: user-friendly, interactive, compatible, index settings, logo, navigation, links, website design, text, and multimedia. Judging from the validation results by media experts, the guided discovery learning-based website learning media developed obtained very good qualifications. Several aspects cause very good qualifications to be achieved, namely: (1) aspects of usability where the website is easily accessible on several devices such as laptops, computers, and cellphones

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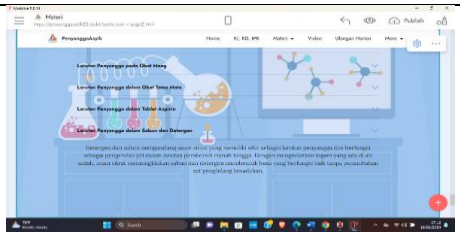
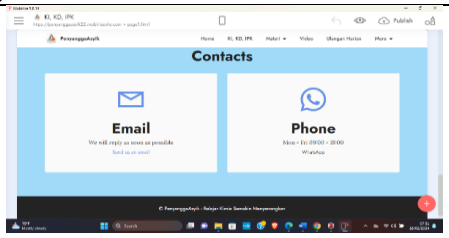
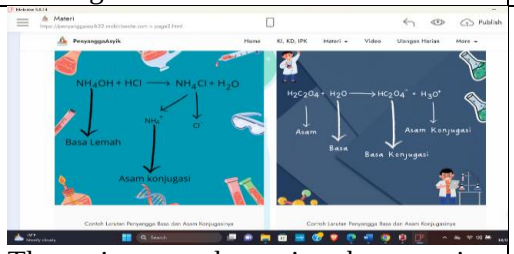
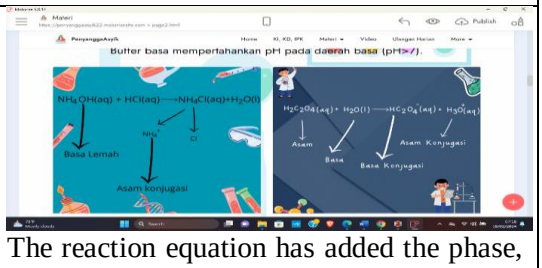
and easily accessible anywhere using the internet. (2) aspects of media organization, which include a visible logo, attractive index settings, and easily accessible navigation and links, and (2) aspects of media design, which include clarity of writing, clarity of sound, a combination of writing, images, videos, and interactive presentations have been fulfilled. The clarity of the voice, the narration supporting the material, the suitability of using sound effects, the suitability of background music in a medium, and the attractiveness of the appearance of video, audio, images, and questions can make it easier to attract the attention of students to increase the motivation and interest in learning of students (Aprianty, 2021). This is in line with the findings of previous research, which states that implementing all information in multimedia that combines text, images, videos, music, and interactivity can make the presentation of material more interesting (Tamara et al., 2019). Based on this statement, it can be concluded that learning media that are packaged interactively by combining various media can make the learning atmosphere more enjoyable and positively influence students in the learning process. Revisions to learning media by material experts and media experts can be seen in Table 7.

Table 7. Revision of material experts and media experts

Expert	Reviews	Revised
Material Expert	 The material can be related to life, so examples of applications for using buffer solutions should not only be mentioned but also discussed in detail (at least 1 or 2).	 The material has been linked to everyday life and discussed in detail.
	 Including contact and email is unnecessary because it uses ample space to not interfere with the student's view of learning.	 Contacts and emails have been removed.
Media Expert	 There is no phase in the reaction equation, and the writing of NH_4^+ is incorrect.	 The reaction equation has added the phase, and the writing of NH_4^+ has been corrected.

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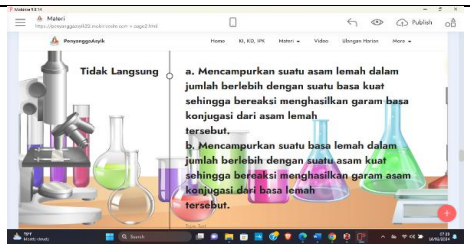
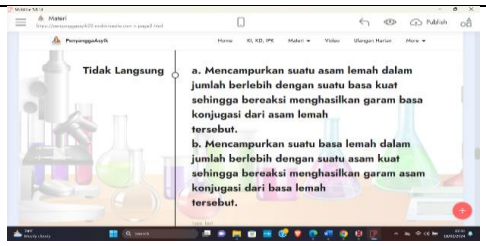
	 The background is sometimes too dominant so that it covers the text.	 The background has been improved so that the text looks good.

Based on the results of the assessment of chemistry teachers in high schools, the average score is 89.4, with an ideal percentage of 89.4%, which is included in the outstanding category. Thus, website learning media is feasible and appropriate if used as a learning media that supports buffer solution material. The table of teacher assessment results can be seen in Table 8.

Table 8. Analysis of teacher reviewer results

Aspect	∑ Indicator	Score	Total Maximum	Average Score	Ideal Percentage (%)	Category
Material Guided	3	31	36	86,1	86,1%	Very Good
Discovery Learning	2	20	24	83,3	83,3%	Very Good
Usability	3	33	36	91,7	91,7%	Very Good
Settings	4	45	48	93,8	93,8%	Very Good
Design	3	32	36	88,8	88,8%	Very Good
Total		161	180	89,4	89,4%	Very Good

After the experts stated that the developed media could be applied to learning in this study, they conducted product trials on students to determine their response to the developed media. Based on the responses from 30 high school students in class XI MIPA, the average score was 92.3, with an ideal percentage of 92.3%, included in the very good category. Overall, the student response received a very good assessment, seen from the assessment results on student comments stating that this learning media presents material that is complete and easy to understand, the website is presented very interestingly and not dull and can help in the chemistry learning process at school. Thus the website developed can be an effective learning media to increase student motivation and learning outcomes. Learning media that combines several aspects of media into one unit can attract students' interest and motivation in learning so that students can understand the material well. This is supported by previous research findings, which state that the existence of learning media can attract students' attention and focus on learning to make learning fun (Febrita & Ulfah, 2019). The results of student responses can be seen in Table 9.

Table 9. Response results of 30 high school students in grade 11 MIPA

Expert/Aspects	Total Score	Maximum Score	Average Score	Ideal Percentage(%)	Category
Material	136	150	90,7	90,7%	Very Good
Media	141	150	94	94%	Very Good
Total	277	300	92,3	92,3%	Very Good

Web learning media based on guided discovery learning is designed attractively according to the needs and characteristics of students and following the characteristics of

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learning (Dwiqi *et* al., 2020). The results of this study are supported by some findings from previous research (Wulandari & Wiarta, 2022), which state that guided discovery-based learning media is declared feasible for use in the learning process. Applying the guided discovery learning model to understanding significantly affects student understanding (Hidayat et al., 2019). So, it can be said that learning media based on guided discovery learning can be feasible to use in the learning process and positively impact student understanding.

Conclusion

The conclusion of the research shows that the learning media developed can be used by teachers and students in the learning process. Data analysis of material expert validation results with two aspects as a whole with a percentage of 100% included in the very valid category. Based on data analysis of media expert validation results, there are three aspects with a percentage of 100% included in the very valid category. The results of data analysis from the assessment of reviewers or chemistry teachers showed an average score of 89.4, the ideal percentage of 89.4%, which is a very good category. The results of 30 students' responses showed an average score of 92.3, an idealized percentage of 92.3%, indicating that the learning media was feasible for students. Overall, it shows that the learning media developed has very valid criteria, is feasible, and can improve material understanding and student learning motivation if used in the learning process.

Recommendation

Recommendations aimed at teachers, students, and other users can use Android and laptops to access the website (mobirise) based on guided discovery learning as learning media. It is hoped that the teacher can become a bridge between students and the learning media website (mobirise) based on guided discovery learning so that students can understand and be more interested in learning buffer solution material.

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