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Development of Google Site-Based E-LKPD to Improve Students' Understanding of Ion Bond Material

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Abstract
This research aims to determine the feasibility of Google site-based E-LKPD on class X ion bond material at SMA Negeri 1 Galing. The population in this study was 25 class X students and samples were taken using a random sampling technique totaling 5 people. This research uses the R & D (Research and Development) research method with the ADDIE model which focuses on the Analysis, Design and Development stages. At the development stage, a feasibility test was carried out by five validators with two assessment aspects, namely material and media using the Content Validity Index (CVI) as a feasibility test.

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INTRODUCTION

In the 21st century, developments in the fields of science and technology have increased rapidly, bringing changes to human life. Like the development of mobile phones, which previously required buttons to operate them, now use touch screen technology. This also requires the education sector which can be made easier by technological developments. According to(Maritsa et al., 2021)In the field of education, technology has an important influence on science because students can study natural phenomena and events, and through this technology humans use technology to apply their knowledge. Technology helps humans create innovations that can improve people's daily lives and make daily tasks easier. This is in line with the objectives of the 2013 curriculum development according to(Permendikbud, 2013)The aim of the 2013 curriculum is to prepare Indonesian people to have the ability to live as individuals and citizens who are faithful, productive, creative, innovative and affective and able to contribute to the life of society, nation, state and world civilization. So by utilizing technology in learning it will have a positive impact on educational progress.

According to(Hamalik, 2014)Learning is a combination that is composed of human elements, materials, facilities, equipment and procedures that influence each other to achieve learning goals, so that learning requires components that interact with each other. According to(Suharningsih & Harmanto, 2016)These components include learning objectives, learning materials, learning methods, learning media, teachers and educators, students, assessment and evaluation. So based on this description, the components that support the learning process are learning materials. The learning process must be in accordance with the curriculum applied.

To support the curriculum, teaching materials are needed that are in accordance with the 2013 curriculum, so there needs to be teacher creativity and innovation in developing teaching

materials. So teaching materials according to current developments are really needed as learning resources for students during the learning process. But according to(Prastowo, 2015)Basically, most teachers only use teaching materials that are practical and ready to use, without making any effort to compile their own teaching materials, because teachers do not understand how to prepare teaching materials.

Based on the problems that occurred in class material and questions in textbooks and some are also loaded in file form and then sent via WhatsApp message. However, the contents of the soft file still cannot explain the material to be studied. So you have to open the internet to complete our learning resources, especially when studying ionic bonding material. Because we cannot understand the explanation if we only read the written material provided." The limited teaching materials used make it difficult for students to understand the material being studied.(van der Weel & Mangen, 2022)Digital media is often used as a substitute for textual information.

According to(Putra et al., 2021)Digital teaching materials are an important element in achieving learning goals. Accessibility of content in digital teaching materials can support an effective and efficient learning process. In the cognitive realm, digital teaching materials can help students more easily understand the concepts in the material and improve their reasoning abilities. Then, digital teaching materials help students learn the material more deeply through learning activities in the form of thinking and understanding, as well as providing practical (concrete) experience to create long-term learning. The success of implementing digital teaching materials to support the learning process depends on the teacher as the coordinator of learning activities.

Chemical bonds are one of the material topics studied at high school level. Chemical bonds are an abstract material because it is difficult for us to see them with the naked eye. This abstract nature is also related to our inability to see atoms, their structure, and how they react with each other. Therefore, many analogies are used to reduce the abstractness of this material (Yasthophi & Ritonga, 2018). One of the sub-materials of chemical bonds is bond material. Therefore, teaching materials are needed that are equipped with visual illustrations that enable students to use their imagination, making it easier to understand the concept of ionic bonding. Based on the description and problems above, the researcher feels it is necessary to carry out research "Development of Google Site-Based E-LKPD to Improve Students' Understanding of Ion Bond Material"

According to(Khotimah et al., 2020)which refers to several opinions that E-LKPD is a digital learning tool as an exercise that aims to develop students' cognitive aspects through developing learning in the form of experiences (Rahayu & Budiyono, 2018). E-LKPD is used as a teaching and learning tool in schools to improve the quality of education (Octaviani, 2017). E-LKPD equipped with media will be clearer and more interesting for students. E-LKPD also has the ability to present material that can arouse students' curiosity and motivate them to be involved physically and emotionally (Haqsari, 2014).

(Putriyana et al., 2020) explained that E-LKPD is a work guide to help students better understand learning material in electronic form, which is implemented using desktop computers, laptops, smartphones and cell phones. A collection of basic activities that must be carried out by students to maximize understanding in an effort to achieve learning goals. Students can study in various places such as via the internet or their cellphones.

According to(Yuniar et al., 2021)In the world of technology, there are various types of applications for education, such as the Google Sites application, software created by Google for online publishing purposes. Google Sites can create and insert various types of images, videos and animations. According to other researchers, the biggest advantage of using Google

Sites is that students no longer use lots of books to study but only need to receive material written by teachers with clear documentation (Adzkiya & Suryaman, 2021) in(Pubian & Herpratiwi, 2022). Based on the description from the researchers above, the use of Google Site as a platform for teaching materials is very necessary to facilitate the learning process.

Many E-LKPD developments have been made in previous research and have provided success in the development process such as research by(Handoko & Prasetyo, 2022)The understanding of class IV A students at SD Negeri Magelang 6 regarding economic activities in online learning after being given LKPD via Google sites increased from pre-cycle by 67.86%, cycle I 78.57%, and cycle II 82.14%. It is also easy for students to access E-LKPD on the device they use and it does not take up a lot of storage space. The use of student worksheets with the help of Google Sites needs to be a guide for teachers because apart from making it easier for teachers and students to use them online, they can be used by students outside of school hours.(Akuba et al., 2023). The use of the Google site-based E-LKPD can also be used for other materials, so that teachers can adapt the material taught in the E-LKPD.

METHOD

One of the designs for developing teaching materials that is often used is the ADDIE Model through 5 stages: Analysis, Design, Development, Implementation and Evaluation(Cahyadi, 2019). The ADDIE model concept is applied to build fundamental performance in learning, namely the concept of developing learning product design. ADDIE is an educational design that focuses on individual learning, has immediate and long-term phases, is systematic, and uses a systematic approach to human knowledge and learning.(Hidayat et al., 2021). There are only three stages of using the ADDIE development model used in this research, namely analysis, design and development with the procedures in chart 1:

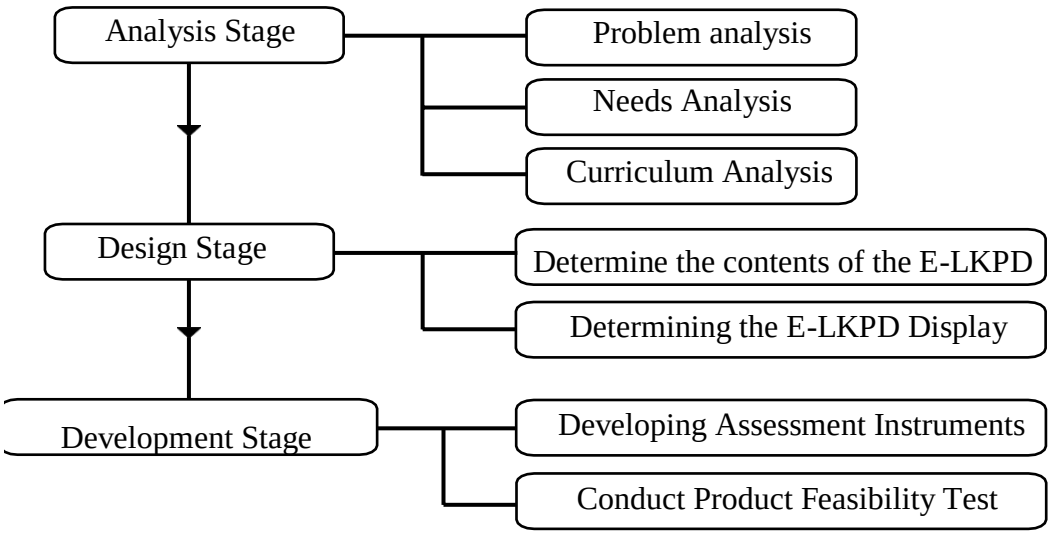


Chart 1. Research Procedure for E-LKPD Development Free from Google Site to Increase Students' Understanding of Ion Bond Material

The level of validity of E-LKPD based on the Google site to increase students' understanding of ionic bonding material can be determined based on a validity test using the content validity index (CVI) approach, namely the technique used to calculate the level of validity of the instrument by calculating the level of relevance of existing items according to individual estimates. each expert, then determine the average level of relevance of these experts. Testing the benefits and value of the content will be important. Content will be authenticated by experts. Presentation materials prepared by certifiers and experts have been studied using the content validity index (CVI) approach(Indarta et al., 2023). CVI is widely used by researchers to determine content validity(Shrotryia & Dhanda, 2019)To avoid a neutral midpoint, the measurement scale used only has 4 points as shown in Table 1.

Table 1. Validator Measurement Scale

Criteria	Score	Index
Completely Irrelevant	1	0
Irrelevant	2	
Relevant	3	1
Very relevant	4	

There are two types of CVI, namely the content validity of each item (I-CVI) and the content validity of all items (S-CVI). Calculate the content validity of the items by adding up the number of experts who provided significant assessments who received scores of 3 and 4 (scale changes to relevant = 1 and irrelevant = 0) then dividing it by the number of experts using the formula in the equation. Explanations regarding I-CVI and S-CVI can be seen in table 2.

Table 2. Explanation of I-CVI and S-CVI

CVI Index	Definition	Formula
I-CVI (Item-level content validity index)	Proportion of content expert giving item relevance rating 3 or 4	I-CVI = number of relevant items/number of all experts
S-CVI/Ave (scale level content validity index based on average method)	Average I-CVI scores for all items on a scale or average of proportions relevance was assessed by all experts. That the relevant proportion is the average relevance ranking by individual experts	S-CVI/Ave = total I-CVI value/number of all items

(Yusoff, 2019)

RESULTS AND DISCUSSION

Analysis Stage

This analysis stage is the stage where researchers analyze the development of E-LKPD, this stage includes 3 things, namely: analysis of problems, needs and curriculum which are described in the explanation below.

Problem analysis was carried out to determine the problems at SMA Negeri 1 Galing related to the use of teaching materials. At this stage, interviews are conducted with students regarding the teaching materials used in learning. Based on the results of interviews that have been conducted, the problem that occurs is that students experience difficulties in understanding chemistry lessons due to the limited teaching materials used. This is in line with what was stated by (Prastowo, 2012) in(Nafidah, 2021)In the current educational era, the majority still use printed educational materials such as textbooks which may never be used by

students or may be considered impractical, so in this case the use of technology in learning is still very lacking.

At the needs analysis stage, it is carried out to determine the needs required by students for learning from the teaching materials used. In conducting interviews with students, researchers used a sample collection technique, namely random sampling. The definition of random sampling put forward by(Sugiyono, 2017)is random sampling from members of a population without taking into account the classes that exist in that population. Based on the researcher's interviews with five class

Curriculum analysis is carried out by analyzing the curriculum used in the school, then researchers based on the KD (Basic Competencies) that have been determined and examine it to determine the learning objectives to be achieved in learning. Based on the analysis that has been carried out, the school uses the 2013 curriculum and researchers use KD 3.5.

Design Stage

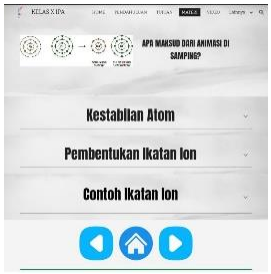
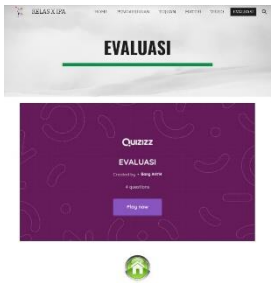
The design stage is the second stage contained in the ADD model stage. This stage is a continuation of the analysis stage previously carried out. The product design that has been prepared is developed based on the following stages:

The content design of the E-LKPD is carried out by determining the elements that will be included in the E-LKPD in the form of a material framework with core competencies and basic competencies that have been adapted to the syllabus in the 2013 curriculum to determine learning objectives and evaluation at the end of learning, this is in line with the opinion of (Prastowo, 2011) in(ER Fitri, 2021)who said that LKPD must be prepared based on the curriculum. The elements used by researchers are home, introduction, learning objectives, materials, videos and evaluations which have been adapted to the needs in achieving learning objectives.

The display design on E-LKPD uses a platform from Google, namely Google Site and for image editing uses the Canva application. The Google site-based E-LKPD display can be seen in table 3.

Table 3. Display of E-LKPD free from Google site to increase students' understanding of ionic bond material

No	View before revision	View after revision	Contents
1			The HOME display contains all the menus that will be used in the learning process

2			The INTRODUCTION menu display contains an image as a stimulus for starting learning and is presented with information about salt
3			The OBJECTIVES menu display contains the learning objectives achieved in the lesson
4			The MATERIAL menu display contains information in the form of material about ionic bonds and is equipped with images as illustrations to understand the material
5			The VIDEO menu display contains a video taken from YouTube with the video theme of ion fish formation
6			The EVALUATION menu contains four questions that are adjusted based on learning objectives and integrated with the Google Form site.

7		The REFERENCE menu contains image, animation and video capture sources.

Development Stage

At the development stage, validation was carried out on the Google site-based E-LKPD. e-LKPD really needs validation steps to ensure it is suitable for use in learning, because e-LKPD, which is an evolution of the presentation aspect of LKPD, contains a series of activities whose systematic design must be carried out by students. form basic competencies that are in accordance with the learning indicators to be achieved (Daryanto and Dwicahyono, 2014) in(Zahroh & Yuliani, 2021). The validity of an E-LKPD based on the Google website can be determined based on a validity check using the Content Validation Index (CVI) method. CVI is one method for checking content validity. CVI tests content validity by inviting a panel of experts to determine that each item in the questionnaire is consistent with the concept (Puspitasari & Febrinita, 2021). Some commonly used labels: 1 = not relevant, 2 = less relevant, 3 = relevant, 4 = very relevant. Then each I-CVI item is calculated by the number of experts who gave a score of either 3 or 4 (so that the dichotomous order scale becomes relevant = 1 and irrelevant = 0), divided by the total number of experts. For example, an item that is considered adequate or very relevant by four out of five experts will have an I-CVI of 0.80 (Polit and Beck, 2006).

Next, the average of each item was found from the 4 experts, which is known as the I-CVI value. After getting the results for the validity of each item, the overall content validity (S-CVI) is then calculated by finding the average value and then categorizing it according to the score obtained in terms of the validity criteria score. Validation eligibility provisions based on the number of validators on the CVI can be seen in table 4.

Table 4. Conditions for Validation Eligibility Based on the Number of Validators in CVI

Number of Experts	Accepted CVI Value	Reference
2 Experts	0.80	Davis (1992)
3-5 Experts	1	Polit & Beck (2006), Polit Et Al., (2007)
6 Experts	0.83	Polit & Beck (2006), Polit Et Al., (2007)
6-8 Experts	0.83	Lynn (1986)
9 Experts	0.78	Lynn (1986)

(Yusoff, 2019)

The ADDIE method model contains activities for the realization of product designs that are made in accordance with the designs that have been prepared. Then the E-LKPD will undergo a feasibility test which is validated by experts. This research uses a validator that will validate the E-LKPD with 3 material experts and 2 media experts. This provision is based on reference to table 4 regarding the minimum value that needs to be achieved according to the number of validators used. Feasibility testing is carried out simultaneously between assessing material aspects and media aspects. In obtaining the assessment, the researcher used a validation instrument that had been declared valid from previous research

with details of 16 points for assessing material aspects and 15 points for assessing media aspects.

The researchers will revise the suggestions and responses given by the validator to improve the designed E-LKPD. Validation is carried out until the product developed is suitable for use. The following are the results of the Google site based E-LKPD validation. Google site based E-LKPD feasibility test on material aspects consisting of 3 experts is presented in table 5.

Table 5. Feasibility Test Results on Material Aspects

No	Rated aspect	V1	V2	V3	Agree Validator	I-CVI
Content Feasibility Aspect						
1	Suitability of material with competencies base.	3	4	3	3	1
2	Suitability of material to purpose learning that has been determined.	3	3	4	3	1
3	Clarity of work instructions during the learning process using media learning.	3	4	4	3	1
4	Ease of understanding the material.	4	4	4	3	1
5	Confusion in the presentation of material.	4	3	3	3	1
6	Ease of understanding images and videos provided.	4	3	4	3	1
7	Ease of understanding examples questions in the video.	3	4	4	3	1
Language Aspects						
8	Correct use of PUEBI.	4	4	4	3	1
9	The sentences used are easy understood.	4	4	4	3	1
10	The sentences used are in accordance with student age development.	4	3	3	3	1
11	There are no sentences that use terms with meaning double.	3	3	4	3	1
Presentation Aspects						
12	Logical presentation of material.	4	3	4	3	1
13	Presentation of concept continuity.	4	4	4	3	1
14	The presentation of the material is equipped with pictures and videos.	3	3	3	3	1
15	The presentation of material can attract students' attention.	3	4	3	3	1
16	The presentation of learning media can guide students in understanding the material	4	4	4	3	1
S-CVI = 1						

From the validation results in Table 5, in the aspect of content suitability, information is obtained that the Google site based E-LKPD teaching materials on ionic bond material are in accordance with the basic competencies used so that the material contained in the E-LKPD can achieve the learning objectives to be achieved and get I-CVI value = 1. This is in line with the opinion of Prastowo (2015) in(Damara Gita et al., 2018)The basic competencies listed in the module are taken from specific curriculum guidelines, then the indicators of the

breadth of material presented support the achievement of basic competencies, which get a score of 100%, this is because the material presented in the module can support the achievement of basic competencies, Prastowo (2015) in (Damara Gita et al., 2018) also said that the material or content of the module will really depend on the basic competencies to be achieved.

The assessment of the language aspects of the E-LKPD is based on the Google site which has used sentences adapted to PUEBI and is easy to understand and received a score of I-CVI = 1 and was declared appropriate according to the feasibility of validation in table 4. This is in line with the statement conveyed by(A. Fitri et al., 2022)namely, by conveying good and correct language, all the messages and information that the writer wants to convey to the reader can be well received.

The assessment of the language aspect of the Google site-based E-LKPD in the presentation aspect of the material has been presented logically, according to existing scientific facts and received a score of I-CVI = 1. The material must be relevant to social and cultural realities so that students better understand world phenomena including change. -changes that occur, the material must include the objectives. The material must be appropriate to the students' abilities and experience, and the material must be in accordance with the students' needs and interests(Istiqomah, nd).

Based on the material aspect feasibility test that has been carried out, it can be concluded that the Google site based E-LKPD on ion bond material is declared suitable for use with an S-CVI value = 1 according to the provisions in table 4.

The next stage, the researcher carried out a feasibility test for the Google site-based E-LKPD on the media aspect consisting of 2 validators with the results presented in table 6.

Table 8. Feasibility Test Results on Media Aspects

No	Rated aspect	V1	V2	Validator Agrees	I-CVI
Display Aspects					
1	Image layout suitability.	4	4	2	1
2	Suitability of background selection.	4	4	2	1
3	Appropriate color proportions.	4	4	2	1
4	Appropriateness in font selection.	4	4	2	1
5	Appropriateness in the use of font size.	4	4	2	1
6	Accurate size of images and videos.	4	4	2	1
7	Clarity of sound when video is played.	4	4	2	1
8	Clarity of internal writing order teaching materials.	4	4	2	1
9	Image and video display quality.	4	3	2	1
10	Suitability of the images and videos presented with the content of the material discussed.	4	4	2	1
Operational Aspects					
11	Ease of use of teaching materials.	4	4	2	1
12	Ease of accessing teaching materials.	3	3	2	1
13	Clarity of the flow displayed in teaching materials.	4	4	2	1
14	Ease of use button on the learning material.	4	4	2	1
15	Suitability of teaching materials to target users.	4	4	2	1

S-CVI = 1

The choice of font must be adjusted to the characteristics of students in order to achieve readability of the material. This is in accordance with the opinion of Sudjana and Rivai (2009) in(Epriani Renat et al., 2017)states that in choosing colors for teaching material purposes, it is necessary to consider them as carefully as possible. Not only that, the suitability of the images and videos presented with the material discussed can make it easier for students to understand the concept of the material. This is in line with Nasution's (2008) statement in (Epriani Renat et al., 2017) that one of the advantages of learning that is presented clearly and specifically is that student learning becomes focused.

From the validation results in Table 6, information is obtained that the Google site based E-LKPD teaching materials on ion bond material in the appearance aspect are appropriate in determining the layout, choosing colors and size of letters and elements contained therein, thus obtaining validation results with a value of I- CVI = 1. Referring to research by Komarudin & Permana (2019), the presentation in e-LKPD of adding other elements also has an influence. Elements mentioned in this research include motivational words, attractive color displays, and emojis. Sticking to the initial goal, e-LKPD was developed to encourage students to learn independently. Therefore, e-LKPD needs to be presented in a more interesting way because students need to be more active in learning activities(Purnama & Suparman, 2020).

Furthermore, the operating aspect of the Google site-based E-LKPD is easy to operate, both in terms of opening access and the buttons used so that it does not make it difficult for students or teachers to carry out learning. The validation results on the operational aspect amount to 5 assessment points with a value of I-CVI = 1. Ease of operation can provide benefits to students, according to the statement from(Sya'idah et al., 2020)that the E-LKPD he created can improve student learning outcomes because students can learn flexibly and students can learn independently because they have the right to explore newly acquired knowledge anytime and anywhere. Apart from that, according to(Indah Monica et al., 2023)Electronic LKPD (e-LKPD) is superior and more attractive than conventional printed LKPD because it contains video, sound, animation, images and navigation which will increase students' enthusiasm and interest in learning and reduce children's boredom. It is more practical and economical because there is no need to pay for printing.

So, based on the value given by the validator for improvements, it can be concluded that the Google site based E-LKPD on ion bond material in the media aspect is declared suitable for use by getting an S-CVI value = 1.

CONCLUSION

Google site based E-LKPD on ionic bonding material was declared valid by the material and media validator with a value of S-CVI = 1. Google site based E-LKPD on ionic bonding material can be used as teaching material that helps improve students' understanding of subject concepts ion bond where the content of the E-LKPD has been adapted to the basic competencies of the curriculum and the appearance has been adapted to the age development of students. So that the benefits obtained from using the Google site-based E-LKPD can be a means of achieving the objectives of the 2013 curriculum.

RECOMMENDATIONS

The development of Google site-based E-LKPD on ion bond material was carried out by researchers only up to the development stage. Therefore, it is necessary to continue with implementation for students, and improvements are still needed in adding animated images. To use it, stable internet access is required so that you don't encounter network errors when opening the menu in the Google site-based E-LKPD.

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