

Validity of Kimi Kimo Adventure Game Based on Android as Learning Media in Chemical Bonds

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ABSTRACT

The purpose of this study is to determine the validity of the Kimi Kimo Adventure game based on android as learning media in Chemical Bonds material at SMK Negeri 1 Driyorejo Gresik. This study discusses the validity of android-based Kimi Kimo Adventure game as learning media in Chemical Bonds material in terms of content validity and constructs validity that obtained from the validation results of 3 media and chemistry experts, which is 1 chemistry teacher at the SMK Negeri 1 Driyorejo Gresik and 2 chemistry lecturers at the Universitas Negeri Surabaya. The research method that used is research and development which carried out to the validation stage by media and chemistry experts. The data that has been validated by experts has an assessment on the content validity and construct validity, each of which obtains a very valid category. Based on the results of the study, it can be concluded that the Kimi Kimo Adventure game developed is valid to be used as a learning media.

Keywords: *Kimi kimo adventure, Android game, Mobile learning, Chemical bond material.*

1. INTRODUCTION

In the era of globalization, education and teaching have shown excellent progress and supported by the event of knowledge technology, which increasingly makes education and science significant. Education is an attempt to make a learning atmosphere in order that students actively develop their potential [1]. Chemistry could be a branch of scientific discipline that studies contexture, properties, configuration, and alteration in energy and matter. Chemistry is an abstract concept that requires skill to reasoning, especially on Chemical Bonding material. So, it needs the appropriate media to assists students understand Chemical Bonding material well [2]. As an educator, the teacher must also be able to make students become competent individuals, not only making students know and understand but also being able to make students being creative individuals. Students are required to have thinking skills which is productive, independent, collaborative, critical, communicative, and creative through a scientific approach to develop what's learned in educational units and other sources independently. To facilitate the chemistry learning process needs a learning media that must match the characteristics of chemical bonding material.

The use of e-learning as distance learning is increasingly getting used within the world of education due to its practicality. Especially during the Covid-19 pandemic, the utilization of learning media is very important in providing educational facilities for distance learning or face-to-face learning. Distance learning is structured learning that takes place without the presence of direct education ahead of students [3]. Other terms of distance learning that synonymous and interchangeable and are merely the popular delivery mechanism for many distance learning are online learning, digital learning, e-learning, and virtual learning [4]. The utilization of appropriate learning media within the learning process can generate new interests, desires, challenges, motivate students to take an active role, and stimulate learning activities that can have a psychological influence on students [5].

There are two forms of information stored in long-term memory, namely visual and verbal. Visually or verbally coded information is better remembered than information encoded in only one of the two ways. For example, someone can remember names well if they can connect them with faces [6]. The educational process of students who have a high interest in learning will feel happy and curious about the topic matter provided by the teacher. Students tend to give greater attention and will be more enthusiastic and participate actively in

learning activities [7], [8]. Everything which will be went to transmit messages from the sender to the recipient, so that it can stimulate the interests, feelings, concerns, and thoughts of students in such the simplest way that the educational process becomes interesting, one of which is the game media [9]. Game media is a learning media that can provide fun as well as knowledge. Based on the characteristics of chemistry, which is an abstract material and full of mathematical concepts that are sometimes not simple, media is required to assist students in understanding the concept. Mobile learning also can be went to assess students learning outcomes. As an educational media, the game has several advantages, which are fun, entertaining to try and do, allows the active participation of students to find out, can provide direct feedback, can apply certain concepts or roles into actual situations, flexible, easy to create, and easy to reproduce [10].

The advantages of mobile learning can be used to overcome the limitations of the personal computer (PC). Mobile learning is learning that is carried out by utilizing mobile devices and mobile networks. Thus, mobile learning is learning by using mobile devices and mobile networks to access learning materials anywhere and anytime. The advantages of mobile devices include being easy to carry, being able to connect to the network anytime and anywhere, being more flexible in accessing learning resources, students can be involved and active [11]. By using mobile learning, teachers can assist students to more easily understand the material that is studied. This is because students can relate the concepts of the subject matter according to their thoughts to stimulate students to more easily understand the material [12].

Students learning outcomes can be improved using game media as mobile learning in line with the requirements of students and teachers as a learning medium to assist students to learn and review Chemistry in a very fun way in achieving learning goals [13], [14], [15]. Games, if used wisely and appropriately can relieve stress within the learning environment, increase enthusiasm within the educational process, and inspire students to be fully involved [16], [17]. In this case, the media that will be used is the media from the Construct 2 application, which will later be converted to Android and easy for students to play because learning chemistry requires understanding concepts with the help of media, especially mobile learning. Understanding these concepts can be achieved by using mobile learning media so the subject matter is patterned visually and graphically, which in turn can help students record, strengthen, and recall the information that has been learned, so the student learning outcomes are better.

Students are expected to use mobile learning as a media and learning resource with or without teacher guidance in achieving learning objectives, but the

teacher's role isn't replaced. The teacher could be a supervisor and motivator. This can be overcome by providing media to use in mobile learning, which will meet the requirements of students. This research aims to determine whether the android-based Kimi Kimo Adventure game is valid to be used as a chemical bond learning media.

2. METHODS

This study uses research and development methods that are intended to provide certain products as well as test the product's validity within the learning process using media. This research is the development of the Kimi Kimo Adventure game as a learning media for Chemical Bonding material based on the research and development method [18]. The data analysis technique obtained during this study used a quantitative descriptive method.

This analysis was conducted to assess the validity of Kimi Kimo Adventure game media derived from the validation sheet. The data from the validation results of the game media were analyzed by calculating the percentage of validity using the following conditions: Each indicator was assessed in a range of 1-5. In the end, the score is converted in percent to determine the level of the game media's validity. Percentage of validity described as in Equation (1) is

$$\frac{\text{Total score of validators}}{\text{Maximum score}} \times 100\%$$

The game is claimed to be valid if the validity percentage of each indicator is in the valid to the very valid category or reaches a score of $\geq 61\%$ according to Table 1 [19].

Table 1. Game validity category

Percentage (%)	Category
0 – 20	Invalid
21 – 40	Less valid
41 – 60	Quite valid
61 – 80	Valid
81 – 100	Very valid

3. RESULTS AND DISCUSSION

The validation process was carried out by experts, namely two chemistry lecturers at the Universitas Negeri Surabaya and one teacher at SMK Negeri 1 Driyorejo Gresik, to obtain comments and suggestions so that the game developed was following the criteria that had been made on the validation sheet. The criteria assessed are aspects of validity content and validity construct. The components of validity content are (1) the concept's truth, which means that the game contains

the correct chemistry concept; (2) having a purpose, which means it has a purpose to be achieved after students play. The components of construct validity include (1) natural science characteristics, (2) having rules, (3) guiding, (4) having success standards, (5) challenging and involving active students, (6) providing feedback, (7) has a decision making, (8) a learning media display, (9) software engineering, (10) audio-visual communication. Kimi Kimo Adventure uses two languages, according to Figure 1, and players can choose the language to be used, namely Indonesian and English. In the following, an explanation and elaboration of content validity and construct validity will be presented.



Figure 1 Display to choose the language.

3.1. Validity Content

The assessment results of the validity content of the game from the validators are in Table 2.

Table 2. Content validity results of kimi kimo adventure game

Rated Aspect	Rating Indicator	Validator			Percent -age (%)
		1	2	3	
The concept's truth	The concept of Chemical Bonds in the game is correct	4	4	5	87
Have a purpose	The material within the game is in accordance with the purpose	4	4	5	87

Content validity relates to the up-to-date and correctness of concepts in the game. Content validity has two components, namely, the concept's truth and having a purpose. Based on Table 2, the Kimi Kimo Adventure has fulfilled the first component of validity content, namely the concept's truth described in the indicators. The first component gets a percentage of validity of 87%, which is in the very valid criteria. Validity is the degree of accuracy with data that happens within the object of research with data that will be reported by researchers. This indicates that the chemistry material, especially Chemical Bonds within the game, is correct and follows the principles of chemistry. The display of chemical bonding material in the game is in Figure 2.



Figure 2 The concept of chemical bonds in the game.

Based on Table 2, the Kimi Kimo Adventure has fulfilled the second component of content validity, the purpose described in the indicators. The second component gets a validity percentage of 87%, which includes very valid criteria. The game must have goals according to the learning objectives, and learning indicators set [20]. Usually, the learning objectives are identified with the achievement of the expected score or points. The Kimi Kimo Adventure game developed to enhance the students' cognitive aspects where the chemistry material in the game is adjusted to the indicators to be achieved. In addition, the questions in the game are made with different levels of questions at each level and are adapted to the question indicators. The average percentage for content validity is 87% which includes very valid.

3.2. Validity Construct

The assessment results of the validity construct of the game from the validators are in Table 3.

Table 3. Construct validity results of kimi kimo adventure game

Rated Aspect	Rating Indicator	Validator			Percentage (%)
		1	2	3	
Natural science characteristics	There is a science process skill activity in the game (analyzing the types of chemical bonds)	4	4	4	80
Having rules	There are guidelines or rules of play	5	4	5	93
Guiding	There are hints to finish the game	4	4	5	87
Having success standards	There are conditions to win the game	4	4	5	87
Challenging and involving active students	Encourage students to play while learning (students play games and there are questions at each level)	4	5	5	93
Providing feedback	There is a penalty if student fail (if the player answers the question incorrectly, the player does not get an additional score)	4	4	4	80
	There is a prize for success (if the player correctly answers the question, the player gets an additional score)	4	4	4	80
Has an element of decision making	There are options in answering questions (multiple choice questions that have 5 answer choices)	4	4	5	87
Display as a learning media	The font size that used is appropriate	4	4	4	80
	The animation used is in accordance with the content (game content contains chemical elements)	4	5	4	87
Software engineering	The game is easy to use (some rules and instructions can be opened to make playing easier)	4	4	4	80
	The game is easy to install (game files are raw files that can be sent between devices using Bluetooth, share it, and laptops and can then be installed immediately)	4	4	4	80
Audio-visual communication	There must be a connection between background, music, and sound effects	4	4	4	80
	There must be harmony between the placement of text and colors and the background design	4	4	4	80

Based on Table 3, the Kimi Kimo Adventure game developed has fulfilled the first component of construct validity, namely the natural science characteristics. It gets 80% in a validity percentage which meets valid criteria described in the indicators for analyzing the types of chemical bonds. Kimi Kimo Adventure game developed has fulfilled the second component of construct validity, which is to have rules with the indicator "there are guidelines or rules of play". This component gets a validity percentage of 93% which includes very valid criteria. Rules can't be changed by the player because it contains every action that has been made by developer [21].

Kimi Kimo Adventure that has been developed has fulfilled the third component of construct validity,

namely guiding in the indicator "there are hints to finish the game". This component gets a validity percentage of 87%, which includes very valid criteria. In the game, there must be instructions or directions for players to achieve the expected goals [21]. Instructions of the Kimi Kimo Adventure game are in Figure 3.

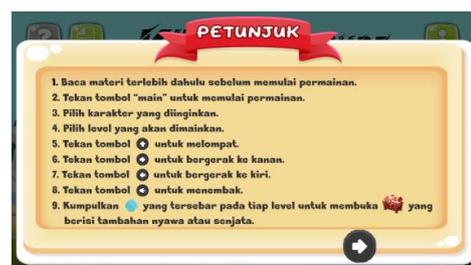


Figure 3 Instructions for player.

Kimi Kimo Adventure has been developed, which has been met the fourth component of construct validity, namely having success standards in the indicator "there are conditions to win the game". This component gets a validity percentage of 87%, which includes very valid criteria. The game has a standard or limit for success after using the game as a learning medium, such as in Figure 4 [22].



Figure 4 Display when player wins and can continue to next level.

Kimi Kimo Adventure has been developed, which has been fulfilled the fifth component of construct validity, which is challenging and involving active students in the indicator "encourage students to play while learning (students play games and there are questions at each level)". This component gets a validity percentage of 93% which includes very valid criteria. Challenges can be in the form of distractions or threats during play or failure in the game [9].

If the player answers the question incorrectly, a pop-up will appear as shown in Figure 5.



Figure 5 Display when player choose the wrong answer.

If the player answers the question correctly, a pop-up will appear as shown in Figure 6.



Figure 6 Display when player choose the right answer.

Kimi Kimo Adventure that has been developed has fulfilled the sixth component of construct validity, namely providing feedback in the indicators "there is a

penalty if the student fails (if the player answers the question incorrectly, the player does not get an additional score)" and "there is a prize for success (if the player correctly answers the question, the player gets an additional score)". Each indicator gets the same percentage of validity, which is 80%, which includes valid criteria. Games can provide immediate feedback, real experiences, can be repeated as many times as desire, and help students who have difficulty learning with conventional methods [18].

Kimi Kimo Adventure developed has fulfilled the seventh component of construct validity, namely has an element of decision making in the indicator "there are options in answering questions (multiple-choice questions that have five answer choices)". This component gets a validity percentage of 87% which includes very valid criteria. In the game, there are options for players to determine or ensure the activities that can be carried out [22]. The questions in the game will appear as shown in Figure 7.

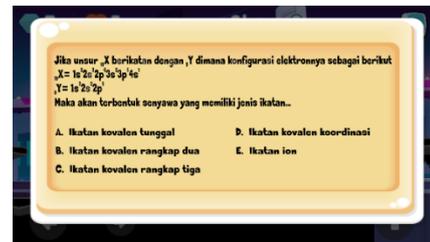


Figure 7 Display when a question appears.

The developed Kimi Kimo Adventure has fulfilled the eighth component of construct validity, namely display as a learning media in the indicators "the font size that used is appropriate" and "the animation used is following the content (game content contains chemical elements)". Each indicator gets a validity percentage of 80%, including valid criteria, and 87%, which includes very valid criteria. Display games as learning media, including colors, sizes, graphics, and animations adapted to the age of the players and the message conveyed [22].

Kimi Kimo Adventure that has been developed has fulfilled the ninth component of construct validity, namely software engineering in the indicators "the game is easy to use (there are rules and instructions that can be opened to make playing easier)" and "the game is easy to install (game files are raw files that can be sent between devices using Bluetooth, share it, laptops, and can then be installed immediately)". Each indicator gets the same percentage of validity, which is 80%, which includes valid criteria. The purpose of these indicators is to use software or game engines which is Construct 2.

The developed Kimi Kimo Adventure has fulfilled the tenth component of construct validity, namely audio-visual communication in the indicators "there

must be a connection between background, music, and sound effects" and "there must be harmony between the placement of text and colors and the background design". Each indicator gets the same percentage of validity, which is 80%, which includes valid criteria. In the developed game, the opening narration and game flow are appropriate and the others are also appropriate so that students do not feel bored with the game being played. The average percentage for construct validity is 83.86% which includes very valid. The first gameplay of Kimi Kimo Adventure game is shown in Figure 8.

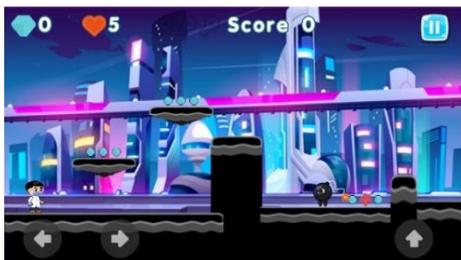


Figure 8 Kimi Kimo Adventure Game Display in Level One.

4. CONCLUSION

The Kimi Kimo Adventure game as an android-based learning media in Chemical Bonds material that developed was declared valid based on experts' assessment. Validity results include content and construct validity, each of which has a percentage value of 87% and 83.86% in each aspect with very valid criteria.

AUTHORS CONTRIBUTION

All authors conceived and designed this study. All authors contributed to the process of revising the manuscript, and at the end all authors have approved the final version of this manuscript.

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