

## Research article

# Analyzing the Validity of Interactive Multimedia-based Learning on Acid Rain Content

Dewi Hikmah Marisda<sup>1</sup>, Rahmawati<sup>1</sup>, Riskawati<sup>1</sup>, Syamuriana Basri<sup>2</sup>, and Anisa<sup>1</sup>

<sup>1</sup>Universitas Muhammadiyah Makassar, Makassar, Indonesia

<sup>2</sup>Universitas Muslim Maros, Indonesia

**ORCID**

Dewi Hikmah Marisda: <https://orcid.org/0000-0003-1317-706X>

**Abstract.**

The primary abilities of physics students at the University of Muhammadiyah Makassar against the scientific concepts learned at the secondary school level vary, resulting in a complex integrated science learning process. The university follows the conventional methods of learning science with little or no use of modern technology. Thus, the present study was conducted to develop interactive multimedia learning using the Macromedia Flash program on integrated science content. The research consisted of two stages. While the first stage included the identification and content analysis of integrated science materials, the second stage comprised designing interactive multimedia learning and testing its validity. Validation was carried out on seven participants and analyzed using the Aiken validation. The validation results showed that the interactive multimedia developed is valid and can be used in Integrated Science lectures.

**Keywords:** interactive multimedia, integrated science, media development

## 1. Introduction

Natural Sciences (IPA) is a part of science that studies nature systematically, both those that can be observed with the senses and those that are not observed with the senses. Therefore, in mastering the concept of science, knowledge is needed in the form of facts, concepts, principles, and the discovery process[1]. The science learning process at the tertiary level needs to be directed to train student teacher candidates to use their thinking potential[2].

Learning in Indonesia faces two challenges today. The first challenge comes from changes in the perception of learning. The second challenge comes from information technology and telecommunications, whose development is extraordinary. Constructivism has essentially answered this first challenge. Learning is defined as a constructive process in which information is converted into knowledge through interpretation, correspondence, representation, and elaboration[3].

Corresponding Author: Dewi Hikmah Marisda; email: [dewihikmah@unismuh.ac.id](mailto:dewihikmah@unismuh.ac.id)

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So far, at the University of Muhammadiyah Makassar, Integrated Science is still taught separately. This makes it difficult for students to understand and relate to the concept of Integrated Science. Integrated Science learning is usually oriented presentation slide media which often causes boredom in the learning process[4]. Besides, the problem faced by lecturers during lectures is the non-uniformity of knowledge bases possessed by students. Some students are still lacking in certain materials, while others are very good at this material. So, as a middle way, lecturers must review material considered urgent but not mastered by students. However, students who have mastered the material feel that reviewing the material is a tedious and time-consuming activity. On the other hand, for those who still do not understand, this review- only repetition is valid even though it is still lacking.

The rapid development of information technology today is inevitable. Almost all activities in the world are carried out using information technology and communication tools[5]. Education is required to face the global challenges that are currently emerging[6]. These changes will continue to develop into the 21st century[7]. To face industrial revolution 4.0, Indonesia continues to make innovations and developments in using technology in learning[8]. This innovation presents media and multimedia in learning activities. This certainly impacts the implementation of the learning process[9]. These changes can have a positive impact on lectures. Also, multimedia in learning can improve learning performance[10].

Based on the problems above, it is essential to develop learning media that utilize technology. One of the learning media that can be used is interactive multimedia with Macromedia flash. Previous research has been carried out related to the use of interactive multimedia in learning. As has been done by[11], the use of interactive multimedia in the form of interactive animation in geometry helps students use symbol language in geometry. Another research on interactive multimedia was carried out by[12]. A combination of the application of interactive conceptual learning models with interactive multimedia in Integrated Science courses can minimize misconceptions in the students.

## 2. Theoretical Review

### 2.1. Interactive Multimedia

Interactive multimedia consists of two syllables, namely multimedia and interactive. Multimedia combines two or more media, such as text media, images, videos, animations,

to combine information into computer devices. Multimedia is an effective technology to improve learning outcomes[13]. Interactive is one-way communication between the sender of the message and the recipient of the message. Interactive multimedia can be explained as the use of computers to combine text, images, animations into one tool used to communicate. Interactive multimedia shows several characteristics, such as displaying more than one convergent, interactive, and independent[14].

Along with the times, interactive multimedia has been used as a medium in learning. Several studies have found that students' knowledge can increase when teachers provide interactive multimedia learning. The use of interactive multimedia provides space for students to be more active in learning. Interactive multimedia can affect student interest and achievement[15]. Interactive multimedia is a multimedia display designed to fulfil the function of delivering messages interactively[16].

## 2.2. Science Integrated

Integrated science is a compulsory subject for Physics Education students at Unismuh Makassar. Integrated Science is a course that studies Physics, Chemistry, and Biology in an integrated manner. The content of each science does not stand alone but complements each other for each learning theme. In integrated science learning, a scientific attitude is needed in the process of discovery or building knowledge[17].

## 3. Methods

### 3.1. Science Integrated

This research is part of the research and development (R&D) stage, which refers to the 4-D device development model. The development of this model tool consists of four stages: defining, designing, developing, and distributing. Whereas in this article, only the results of the validation stage for interactive multimedia media based on Macromedia flash are presented. This is so that the validation results can be presented in more detail. Developing interactive multimedia based on Macromedia flash requires validation from experts to ensure the interactive multimedia media produced is feasible or not for use.

### 3.2. Demographi Partisipant

The test subjects are people whose role is to assess the appropriateness of media products by filling out a questionnaire provided with the product. The research stage is that after the interactive multimedia media product has been developed, it is then submitted to the respective validators. On the validation sheet, there are several assessment indicators for the learning media developed. These indicators include aspects of the material, illustrations, quality, media appearance, and attractiveness.

### 3.3. Data Analysis Technique

The data obtained are qualitative data and quantitative data. Qualitative data include criticism, suggestions, and comments from experts on the developed interactive multimedia media. Meanwhile, the quantitative data is in the form of the score given by the validator on the validation sheet. To determine the validity of the content, researchers can determine the number of rating categories they want[18]. The large number of rating categories selected will affect the content validity standard determined by Aiken[19]. The number of categories for the smallest rating formulated by Aiken is two and the most is seven[20]. This study uses 5 rating categories and 7 ratings. Based on the standards set by Aiken, the minimum standard of validity ( $V$  Aiken) for this study is 0,75 with a probability of 0,41.

The formula used in calculating the validity of Aiken ( $V$  Aiken) is as follows:

$$V = \frac{\sum (r - lo)}{[n(c - 1)]}$$

Information :

$r$  = the value given by the validator

$lo$  = the lowest validity score

$c$  = the highest validity score

$n$  = number of validators who provide an assessment[21].

The validator assessment criteria for scoring can be seen in the following table.

## 4. Results and Discussion

In developing interactive multimedia learning media based on Macromedia flash, a validation stage is needed. Validation is used to determine whether the resulting interactive

TABLE 1: Description of Validator Responses.

Alternative Answers	Score
Most relevant (highest rating)	5
Least relevant (lowest validity assessment)	1

multimedia media is appropriate or not for use. Several aspects are assessed at the validation stage. These aspects include material, illustrations, quality and appearance of the media, and the appeal of the media produced

## 5. Results

The results of the validation analysis provided by several validators can be seen in the following table.

The scores obtained for interactive multimedia learning media based on Macromedia flash were analyzed using the V Aiken validity analysis. The results of the validity analysis can be declared valid if they meet the V Aiken coefficient limits. The boundary requirement for the V Aiken coefficient for five rating scales and seven raters is 0,75 with a probability of 0,41. Each indicator in material, assessment, illustration, media quality and appearance, and media attractiveness got a V Aiken score above 0,75. Therefore, interactive multimedia learning media based on Macromedia flash can be declared valid to be suitable for use in Integrated Science learning.

The acquisition of the V Aiken average score for each assessment aspect can be seen in the following table.

## 6. Discussion

The use of multimedia began in 1950. Since then, it has been tried to combine several media with improving the quality of learning in education[22]. Good interaction is needed in the learning process. Interaction is needed in the learning process. The interaction referred to is good communication between teachers and students. The teacher acts as a messenger, students as the recipient of the message, and learning material as the message conveyed. The material in question is knowledge.

Interactive multimedia is one of the latest models in communication and information technology (ICT) via computer, which is the starting point for choosing an investigative practice approach to science learning. Interactive multimedia developed in this research

TABLE 2: Results of Data Validation Analysis of Interactive Multimedia Learning Media.

No.	Aspects assessed	Validator's Assessment Score							Aiken Index (V count)	Category
		1	2	3	4	5	6	7		
<b>I Theory</b>										
1.	The media used is following the learning material.	3	4	4	5	4	5	4	0.821	Valid
2.	The media used is following the learning objectives.	4	4	4	5	3	4	5	0.786	Valid
3.	Learning media following the learning outcome of learning	3	4	5	5	4	4	4	0.786	Valid
<b>II Illustration</b>										
1.	The media used can provide illustrations in following the actual situation.	3	3	4	5	5	4	4	0.750	Valid
2.	Media makes it easy for students to imagine a phenomenon.	4	3	4	4	4	5	5	0.786	Valid
<b>III Media Quality and Appearance</b>										
1.	Media appearances attract attention	4	4	5	4	4	5	5	0.857	Valid
2.	The media used is not easily damaged/disturbed.	3	3	4	5	5	4	5	0.786	Valid
<b>IV Attractiveness</b>										
1.	The use of media can reduce student dependence on lectures.	4	4	4	5	5	4	4	0.821	Valid
2.	The use of media can minimize misunderstanding of concepts (misconceptions)	4	4	4	3	4	4	5	0.750	Valid

TABLE 3: V Aiken's average score for each aspect of the assessment.

Rated aspect	Average V Aiken Score
Theory	0,798
Illustration	0,768
Media quality and appearance	0,821
Attractiveness	0,786

is interactive multimedia learning media based on Macromedia flash. Interactive multimedia developed is interactive multimedia based on Macromedia flash on acid rain

material. The selection of this material is based on material analysis and content that causes the most misconceptions to students if it is taught casually in the classroom. Therefore made in the form of interactive multimedia based on Macromedia flash. This is in line with research on the use of multimedia in engineering learning. Learning with a conventional approach has no doubt its benefits. However, with the introduction and use of interactive multimedia in presentation slides, the resulting learning process is more interesting, creative, and impressive for students. The use of audio, video, text, and animation elements simultaneously makes students more comfortable in the learning process[23]. The use of images and animation in learning turns out not only to make the learning process enjoyable, in research[24] found that using images in learning media improves student performance. Another variable that also increases is student self-confidence. This increases the metacognitive effect caused by the use of images in learning. Interactive multimedia in teaching is also effective in teaching primary mathematics for new engineering students[25].

In developing instructional media, validation is a crucial step to determine the feasibility of the media. The media developed must be valid so that other feasibility indicators can be tested, such as the practicality and effectiveness of the media. In this study, what will be measured is the accuracy of the use of media in the Integrated Science course, especially on acid rain material. The validation was carried out on three experts and four media users. The validation of the learning media was analyzed using the Aiken count validation formula. Based on the standard determined by Aiken, the minimum standard of validity value ( $V$  Aiken) for this study was 0,75 with a probability of 0,41. The results of the validation data analysis can be seen in Table 2. Table 2 The results of the data validation analysis of interactive multimedia learning media for each statement provide valid results. Because the  $V$  Aiken value obtained is above the Aiken calculation standard, which is 0,75.

Besides, if analyzed for each aspect of the indicators assessed, it also shows a valid value and is suitable for use. The results of this analysis can be seen in table 3. Average  $V$  Aiken score for each aspect of the assessment. Likewise, when presented in diagrammatic form, it can be seen clearly on the graph. The average  $V$  Aiken score for each aspect of the assessment. So if it is seen from the results of the resulting validation data analysis, it can be seen clearly on the graph. The average  $V$  Aiken score for each aspect of the assessment. So if it is seen from the results of the resulting validation data analysis, it can be seen that the interactive multimedia media based on Macromedia flash is declared valid and can be used in Integrated Science lectures on acid rain material.

In addition to the quantitative analysis of the data, some comments and suggestions on the learning media validation sheet become qualitative data that describe in detail the improvements that researchers should make to the media being developed. The suggestions from the validator for interactive multimedia learning media based on Macromedia flash on acid rain material, namely :

1. Adding core competencies and essential competencies in the media.
2. Improvements to animated images and unclear text.
3. Questions that appear on the slide are made more communicative.
4. The identity of the material is completed on the first slide.
5. Deepening the material by providing examples of contextual cases.
6. Addition of apperception material that stimulates student curiosity.
7. Expand the illustrations and animations about acid rain.

Based on the validator's comments and suggestions, changes and improvements were made to the interactive multimedia learning media based on Macromedia flash. Changes in the appearance and attractiveness of the media, including the addition of illustrations and animations following the principles of good multimedia planning. The principles of learning media design include the principle of proportionality, the principle of emphasis, the principle of balance, the principle of rhythm, the principle of harmony, and the principle of unity[26]. Also, things that need to be considered in interactive media are interface including navigation buttons, text, and graphic elements outside of content, content, audio, and video or animation. The consistent placement of the cursor is also an essential element in interactive learning media.

Multimedia is considered a cost-effective and practical learning medium[27]. In addition to the use of interactive multimedia learning media in learning, similar studies have developed interactive multimedia modules that can help students in electrochemistry lectures[28]. Similar research in learning English which also uses interactive modules can improve the quality of student-centered learning (SCL)[29]. Not only suitable for use in engineering learning, English, and mathematics, interactive multimedia learning is also appropriate for use in science learning. The application of interactive multimedia learning to biological matriculation in Malaysia can improve the quality of biology learning[30] In biology learning. A study was also found on interactive multimedia with a cooperative approach to learning cell respiration which can improve higher-order thinking skills[31]. In physics learning, interactive multimedia combined with problem-solving

learning models can improve students' thinking skills in physics[32]. This interactive multimedia has excellent benefits in stimulating students' understanding of learning. Interactive multimedia can also be used for students with particular learning disabilities (dyslexia) who usually have poor short-term memory and have difficulty orientating, counting, reading, and writing. With the use of interactive multimedia with a prototype learning object found a positive response from dyslexic sufferers in learning[33].

Along with the times and technological advances, the use of interactive multimedia is also growing. A study succeeded in developing interactive multimedia learning in the form of mobile devices. Multimedia-based mobile applications promote learning the Iban language, which has a unique culture and language[34].

Besides being used in learning, the use of interactive multimedia can also be used in other fields. One of them is to analyze stunting or significant nutritional problems in Indonesia. The implementation of interactive multimedia can increase simplicity, user involvement, intuition, and availability in processing stunting case data in Indonesia[35].

## 7. Conclusion

The validation test results of interactive multimedia interactive learning media based on Macromedia flash on acid rain material include aspects of a material assessment, illustrations, quality, and media appearance and attractiveness. From the validation of the assessment aspect, it shows valid results. So it can be concluded that the media products produced on acid rain material are declared valid and can be used by students in Integrated Science learning. For this multimedia to have a high level of feasibility, it is then necessary to test the effectiveness and practicality of using media before the next stage of development is carried out.

## 8. Future Research

After obtaining a valid learning media, then a trial is carried out with a broader sample. This is done to test the effectiveness of the learning media that has been developed.

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