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VALIDITY OF PROBLEM-BASED E-MAGAZINE ON HUMAN DIGESTIVE SYSTEM FOR PRIMARY SCHOOL SCIENCE LEARNING

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Abstract	This study aims to produce a valid e-magazine on human digestive system material developed using a problem-based learning model for primary school science learning. The research method used is research and development (R&D) using the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). This research was conducted until the Development stage. The data collection technique used a validation questionnaire instrument sheet with Likert scale scoring guidelines. Based on the validity results obtained from teaching material design experts, the percentage results of the validation questionnaire on e-magazine teaching materials were 100% with very valid criteria, language experts obtained the percentage results of the validation questionnaire on e-magazine teaching materials of 92.5% with very valid criteria and learning material experts obtained the percentage results of the validation questionnaire on e-magazine teaching materials of 92.5% with very valid criteria. Based on the results of the calculation of the average validation of the validation of teaching material design, linguists, and learning materials, the calculation result is 95% with very valid criteria. It can be concluded that the validity test to determine the validity of this e-magazine is declared very valid for use in teaching and learning activities in the classroom.
Keywords	E-Magazine, Human Digestive System, Primary School, Problem Based Learning, Science

INTRODUCTION

The 21st century makes the development of the world demanded to advance in all fields, especially education. Science and technology are developing rapidly, this can be seen with the existence of e-learning, e-books, mobile learning and virtual reality. Increasingly, education in the current digital era demands various innovations in learning. In the 21st century, students are expected to have 4C skills consisting of critical thinking, creativity, communication, and collaboration (Iriawan, 2017).

This 4C skill is very important to learn in education so that students have social skills and global insights, one of which teachers can apply a problem-based learning model. One of the more popular learning models is problem-based learning (PBL) which encourages students to actively think critically in solving problems through real experiences in everyday life. Problem Based Learning is a learning approach that places students in the learning process by emphasizing real-world problem solving as a means of acquiring knowledge and skills. Problem-based learning emphasizes learners to engage in complex and challenging problems. This allows learners to independently solve problems and reflect on experiences, while the teacher's job becomes a facilitator of the learning process rather than focusing on providing knowledge (Mardiyana et al., 2021). According to (Setyo et al., 2020) problem-based learning is a learning model that presents various problems in the real world of students to serve as a source and means of learning as an effort to provide experience in improving critical thinking skills, problem solving skills, without putting aside knowledge or concepts that are learning objectives. Problem-based learning relates to the concept of learning that solves meaningful problems that are relevant and contextual.

Current technological developments make print-based teaching materials change to digital-based. Teaching materials are learning resources and materials that are presented coherently in accordance with the applicable curriculum (Magdalena et al., 2020). Teaching materials are all forms of material that will be conveyed to students in accordance with learning objectives with the opinions of experts and individuals who are the basis so that the material presented can provide new knowledge in studying the material to be studied by students (Sugiarni, 2021). Teaching materials contain a description of the knowledge, experience and theoretical material used by teachers and students to make it easier to understand a number of materials or subject matter regulated by the curriculum (Kosasih, 2020). One of the teaching materials that adopts technology is a digital magazine. Digital magazine is one of the teaching materials used to convey material

visually and informatively by combining text, images, and graphics that can be accessed digitally. E-magazine is a form of learning technology innovation in developing learning resources that can be utilized in learning activities to help active students in fun learning in the classroom (Rohmah et al., 2020). According to (Nurhasanah et al., 2022) e-magazine is an electronic version of a magazine that is not printed but in use with the help of smartphones, laptops and computers. According to (Falahudin, 2014) e-magazine is a learning resource that contains learning materials that are displayed attractively with several supporting features such as images, videos, and audio. The importance of using teaching materials that are integrated with problem-based learning and technology as supporting materials for the learning process, one of which is in science learning.

Science learning is one of the lessons that is suitable for implementing problem-based learning. Natural Science is a science that studies living things and natural objects and reveals natural phenomena that are systematically arranged based on the results of experiments and observations (Pratiwi, 2021). The digestive system, as one of the basic materials in science, has complexity that requires in-depth understanding so that students can connect scientific concepts with everyday life. The human digestive system is a series of organs that work together to process food, convert it into nutrients that can be absorbed by the body and remove the remains that are not needed. According to (Khikmah & Susantini, 2019) In the material of the human digestive system, students are required to be able to analyze problems and contextual information about the digestive system which will later be associated with the concept of digestion during the learning process. E-magazine is one of the suitable teaching materials to support the learning process of science material on human digestive system. The e-magazine is designed to deliver material about the human digestive system in primary schools that is presented in an interactive and interesting way. Through the use of magazine teaching materials integrated with problem-based learning in human digestive system science learning, it aims to make complex material easier to understand, relevant, and applicable in everyday life.

Based on pre-research, the problem is that learning at SDN Gunung Sekar 2 Sampang is the lack of use of teaching materials that are integrated with problem-based learning and still focuses on the use of printed teaching materials / package books in the learning process. This can be seen when researchers conducted observation activities during science learning, that teachers only use package books provided by the government which makes the teaching materials used less relevant so that students still have difficulty solving problems in science learning and decreasing students'

interest in learning caused by the lack of teacher knowledge of the use of interesting teaching materials.

The results of observations supported by the results of interviews with fifth grade teachers found that teachers in learning science do not yet have problem-based teaching materials because of the use of teaching materials that focus on one teaching material and the lack of teacher knowledge of teaching materials and the application of learner-centered learning models and projects make it difficult for students to solve a problem in science learning topics. Based on the results of the questionnaire of the needs of teaching materials for fifth grade students of SDN Gunung Sekar 2 Sampang, 36% of students have experience reading teaching materials other than textbooks and 75% of students stated that they really need interesting digital teaching materials. 78% of students already have smartphones and can access the internet.

Therefore, it is important to evaluate the validity of an e-magazine designed based on problem-based learning, to ensure that the material presented is not only informative but also relevant and appropriate to the needs of learners in primary schools. This research is also supported by several previous studies that have been conducted before this study, namely research conducted by (Usri & Fitria, 2023), the results of the validity test of the E-Book assisted by the Kvisoft Flipbook Maker Pro application in learning science and social studies in grade IV primary schools developed were 96% for material experts, 96% for media experts, and 94% for linguists with a very valid category. Then, the research conducted by (Trisna et al., 2022), the results showed that the problem-based learning-oriented e-magazine was valid for use in learning and effective in improving critical thinking skills and attitudes towards laboratory safety. Research conducted by (Rohmah et al., 2020) the results of research on e-magazines for primary schools have shown their validity and effectiveness as learning tools. This is indicated by the results of android-based e-magazines rated high for content and media quality, with expert evaluations resulting in scores of 95-100% for material and media suitability. Research conducted by (Fuad et al., 2020) the results showed the results of the validity test with an average percentage of media feasibility of 82%. While the feasibility of the material with an overall percentage of 81%, both are in the very feasible category. The results of the field trial on teacher and student responses obtained an overall value of 83% of the teacher's response and the student trial obtained a value of 81%, both of which were in the positive response category. From the feasibility assessment based on validity and practicality, it can be concluded that e-magazine as a learning resource is valid and practical.

Based on the problems described above, the research aims to produce a valid e-magazine on human digestive system material developed using the problem-based learning model for primary school science learning. Through this research, it is expected that evidence can be found about the validity of e-magazine in improving students' understanding and supporting a more interactive and fun learning process. Thus, this research not only provides insight for educators in using digital media, but also contributes to the development of a more innovative curriculum at the basic education level and makes it easier for students to achieve the learning objectives of human digestive system material.

METHOD

This research is a research and development (R&D). Research and development (R&D) is a research method used to produce certain products and test the effectiveness of these products. (Sugiyono, 2016). The purpose of this study is to develop a product and validate it so that it can be used in the learning process. The product that will be developed by researchers in this study is a problem-based learning e-magazine displayed through heyzine flip for grade V primary school.

In this research, the R&D model used is the ADDIE model. The stages of the ADDIE model include Analysis, Design, Development, Implementation, Evaluation. The stages of the ADDIE model are shown in Figure 1. Based on the figure, the evaluation stage is always carried out at the end of another stage. In this study, researchers limited the R&D stages not to the implementation stage.

Figure 1. Tahapan Model ADDIE (Branch, 2009)
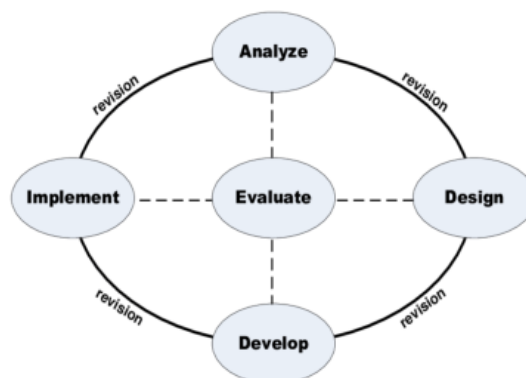
(Resource: (Branch, 2009, p. 2))

The description of the R&D procedure carried out is as follows.

1. Analysis

At this stage, the researcher analyzes the needs required for the development of e-magazine. Research and development in this stage carried out material analysis activities, analyzing the needs of students and the characteristics of students through interviews, observations of grade V teachers and distributing needs questionnaires to grade V students and formulating science learning objectives according to the needs of grade V students of SDN Gunung Sekar 2 Sampang.

2. Design

In the next stage, researchers conducted a planning or design stage regarding the e-magazine teaching materials to be created. Designing the materials and creating a storyboard. Design the e-magazine using the Canva application.

3. Development

At this stage, researchers make products in the form of e-magazine teaching materials from the human digestive system material for grade V primary school. In the development stage, researchers collect materials that support in developing e-magazine teaching materials and produce or revise teaching materials that will be used to achieve the learning objectives that have been formulated. In addition, at this stage, product validation tests are carried out including language, learning design, and material validation tests.

4. Evaluation

At this stage, researchers evaluate each stage such as the analysis, design, and development stages.

The analysis activities were carried out at SDN Gunung Sekar 2 Sampang, which is located in Sampang Regency. The validation activities were carried out by experts. The data collection technique used a validation questionnaire instrument sheet with Likert scale scoring guidelines. The validity questionnaire instrument sheet was used in the validation procedure carried out by this study. The following is a table of scoring guidelines for the percentage validity of teaching materials used for e-magazine development.

Table 1. Validity Percentage of Teaching Materials

No	Score	Criteria of Validity
1.	$81{,}25\% \leq \text{Val} \leq 100\%$	Very Valid
2.	$62{,}5\% \leq \text{Val} < 81{,}25\%$	Fairly Valid

| 3. | 43,75% ≤ Val < 62,5% | Less than Valid |
| 4. | 25% ≤ Val < 43,75% | Invalid |

At this validation stage, media products that have been developed will be tested by experts to find out the assessment, criticisms and suggestions from language validators, teaching material design validators, and learning material validators. This validation activity applies a formula that comes from (Akbar, 2017) that is as follows:

$$Vah = \frac{TSe}{TSh} \times 100\%$$

Description:

Vah   = expert validation test

Tse   = total empirical score (number of scores obtained)

TSh   = total expected score

As for after the value of the calculation of the three experts is known, the next stage is to calculate the average validation with the following formula:

$$\widetilde{X} = \frac{Vah1 + Vah2 + Vah3}{3} = \cdots \%$$

Description:

$\widetilde{X}$ = average validation

Vah_1 = teaching material design expert validation

Vah_2 = language expert validation

Vah_3 = validation of learning materials

FINDINGS AND DISCUSSION

Findings

The results of this study were obtained from interviews, observations and questionnaires of teaching material needs. Researchers found that SDN Gunung Sekar 2 Sampang does not yet have problem-based electronic teaching materials to be used in the learning process. In addition, the questionnaire results show that students prefer to read with teaching materials that have many interesting pictures and few sentences. Based on this information, the researcher took a step by designing teaching materials in the form of problem-based learning e-magazine displayed in heyzine flip. The problem-based e-magazine that will be tested on students will be tested for product validity, including validation of language, learning design, and material. Through the assessment of the validators, the e-magazine will be evaluated and targeted. The following is an explanation of the

expert testing stage.

1. Teaching Material Design Validation

Learning design validation was conducted on October 24, 2024 with the aim of obtaining research, criticism and suggestions for improvement from learning design validators on e-magazine. The validation of teaching material design experts was carried out by teaching material design experts who were willing to provide an assessment of suggestions, experience and competence in the field of design. The data from the teaching material design expert validation results are as follows.

Table 2. Teaching Material Design Validation Results

No	Assessed Aspect	Average Validator Rating	Criteria
1.	Completeness of illustrated e-magazine components	4	Very agree
2.	Suitability of font selection and text size	4	Very agree
3.	Proportional layout (text and image layout)	4	Very agree
4.	Suitability of illustrations with the content of educational stories	4	Very agree
5.	Suitability of background choice	4	Very agree
6.	Clarity of illustration images	4	Very agree
7.	Attractiveness of cover design	4	Very agree
8.	Clarity of content	4	Very agree
9.	Image presentation	4	Very agree
10.	Ease of use of illustrated e-magazines	4	Very agree
11.	Ease of use of e-magazines	4	Very agree
Scores obtained		44	
Maximal score		44	

Based on the assessment given by the design validator on e-magazine teaching materials, it can be seen from the acquisition of the score given by the validator is 44 out of a maximum score of 44. In accordance with what is shown in table 1. Researchers analyzed the data from the validation of the teaching material design using the formula. The following is the calculation of the results of the learning design expert assessment.

$Vah_1 = \frac{44}{44} \times 100\%$

$Vah_1 = 100\%$

Based on the data calculations that have been carried out, the percentage results from the validation questionnaire on e-magazine teaching materials are 100% with very valid criteria.

The criticisms, suggestions, and notes of improvement by the validators are changing the

elements of children's characters on the e-magazine cover to make the children's characters look funnier and more interesting, changing some bagrounds to make them look more contrasting in color, and adding reading instructions and command sentences to fill in the answers.

2. Languange Validation

Language validation was carried out on November 7, 2024 with the aim of obtaining research, criticism and suggestions for improvement from language validators on e-magazine. The linguist validation was carried out by linguists who have been willing to provide an assessment of suggestions, experience and competence in the field of language. The data from the linguist validation results are as follows.

Table 3. Results of Language Expert Validation

No	Assessed Aspect	Average Validator Rating	Criteria
1.	Use of appropriate spelling	3	Agree
2.	Appropriate use of punctuation	4	Very agree
3.	Use of accurate and correct language	3	Agree
4.	The use of sentences in electronic magazines is easy to understand	4	Very agree
5.	The language used is appropriate to the cognitive level of the student's ability	4	Very agree
6.	The choice of words used is easy to recognize and understand by students	4	Very agree
7.	The language used is communicative	4	Very agree
8.	Sentences used do not cause multiple interpretations	3	Agree
9.	The language used is effective and efficient	4	Very agree
10.	Clarity of language use in providing information	4	Very agree
Scores obtained		37	
Maximal score		40	

Based on the assessment given by the language validator on the e-magazine teaching materials, it can be seen from the acquisition of the score given by the validator is 37 out of a maximum score of 40. As shown in table 2. The following is the calculation of the results of the linguist's assessment.

$$Vah_2 = \frac{37}{40} \times 100\%$$

$$Vah_2 = 92{,}5\%$$

Based on the data calculations that have been carried out, the percentage results from the validation questionnaire on e-magazine teaching materials are 92.5% with very valid criteria. In addition to providing an assessment on the questionnaire sheet, the validator also provided

criticism, suggestions, and notes for improvement by the validator, namely improving punctuation and spelling that must be in accordance with PUEBI rules and changing sentences that are less effective and efficient so that they can be easily understood by students.

3. Learning Material Validation

Validation of learning materials was carried out on November 6, 2024 with the aim of obtaining research, criticism and suggestions for improvement from validators of learning materials for e-magazine. Validation of learning materials is carried out by material experts who are willing to provide assessment of suggestions, experience and competent in the field of primary science learning materials. The data from the linguist validation results are as follows.

Table 4. Learning Material Validation Results

No	Assessed Aspect	Average Validator Rating	Criteria
1.	Suitability of material with learning outcomes	3	Agree
2.	Suitability of material with learning objectives	3	Agree
3.	Suitability of material with the flow of learning objectives	3	Agree
4.	The accuracy of material selection with problem-based electornic magazines on human digestive system material.	4	Very Agree
5.	The material has been presented on the problem-based digestive system.	4	Very Agree
6.	The digestive system material can be presented more clearly through a problem-based e-magazine on the human digestive system.	4	Very Agree
7.	The digestive system material can be integrated more clearly through a problem-based e-magazine on the human digestive system.	4	Very Agree
8.	Materials in accordance with the e-magazine created to determine the level of student understanding	4	Very Agree
9.	The material presented in the electronic magazine can attract students' reading interest	4	Very Agree
10.	Suitability of electronic magazines with learning materials	4	Very Agree
	Scores obtained	37	
	Maximal score	40	

Based on the assessment given by the validator of learning materials on e-magazine teaching

materials, it can be seen from the acquisition of the score given by the validator is 37 out of a maximum score of 40. As shown in table 3. Researchers analyzed the data from the validation of learning materials on these teaching materials using the formula. The following is the calculation of the results of the learning material expert assessment.

$Vah_3 = \frac{37}{40} \times 100\%$

$Vah_3 = 92,5\%$

Based on the data calculations that have been carried out, the percentage results from the validation questionnaire on e-magazine teaching materials are 92.5% with very valid criteria. The criticisms, suggestions, and notes of improvement by the validator are the addition of learning outcomes and learning objectives in the e-magazine.
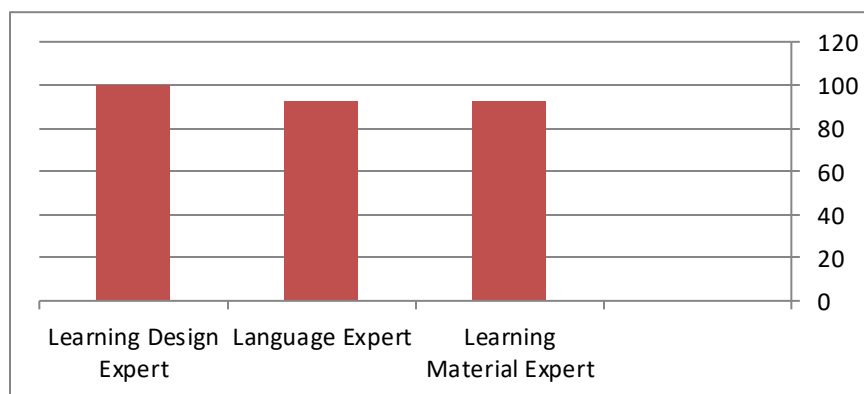
Discussion

Figure 2. Average Validation Results

After the analysis data from the three validators is known, the next step is to calculate the average. The results of these validators are to determine the final results of e-magazine teaching materials can be said to be valid for use in learning activities in the classroom. The following is the average validation of the validators calculated by the formula and will be analyzed into the validity criteria category in the table to determine the validity of the e-magazine, which is as follows.

$\tilde{X} = \frac{Vah1 + Vah2 + Vah3}{3}$

$\tilde{X} = \frac{100\% + 92,5\% + 92,5\%}{3}$

$\tilde{X} = 95\%$

Based on the results of the calculation of the average validation of the validation of teaching material design, linguists, and learning materials, the calculation result is 95% with very valid criteria. According to (Rusnilawati & Gustiana, 2017) It is mentioned that the electronic teaching materials developed can be said to be valid, if at least the level of validity achieved is a good

category. So, it can be concluded that in the validity test to determine the validity of this e-magazine, it is declared very valid for use in teaching and learning activities in the classroom.

The validity test of the e-magazine refers to three assessment components, namely, the design of teaching materials, language and learning materials, which are determined by the validator to be very valid. The designed e-magazine can be included in the highly valid criteria, one of which is revisions or suggestions for improvement from validators who are experts in their fields. Based on the validation results conducted by the validators, the product development of teaching materials is an e-magazine that can be used by teachers and students in primary schools, especially grade V as an alternative learning resource besides printed books.

The assessment aspects of the design validation of teaching materials fall into very valid criteria, the evaluated indicators include the suitability of the image, proportional layout, selection of font type and size, the background chosen, the clarity of the image and the content of the material and the attractiveness of the cover design. This can attract the attention of students when using e-magazine as one of the teaching materials in the classroom. According to (Cahyani et al., 2020) that an attractive media design can motivate students to learn, this can make it easier for teachers to achieve learning objectives. According to (Gogahu & Prasetyo, 2020) which suggests that reading books for elementary schools must present a lot of interesting text, colors, and images in order to attract students' reading interest in learning. An attractive design is also able to make learners maintain their focus on reading and make the learning process more enjoyable (Hassan et al., 2015). The assessment aspects of linguist validation are in the range of very valid criteria, the indicators evaluated are in the realm of language such as the use of good and correct spelling and punctuation, the use of effective and efficient language and sentences so that they can be easily understood by students. This is in accordance with research conducted by (Qhadafi, 2018) that effective teaching materials must be in accordance with PUEBI rules, this is because it can facilitate students' understanding after reading or learning to use these teaching materials. According to (Setiawan, 2023) the use of simple language and in accordance with the level of student understanding is one of the important factors in the preparation of teaching materials. This is in accordance with research conducted by (Pahruddin Harahap et al., 2024) that the delivery of material with simple language and according to the level of understanding of students is effective in achieving learning objectives. In addition, there are indicators that are evaluated for the assessment aspect of learning material validation, namely by adding learning outcomes, learning objectives and the flow of learning

objectives in the e-magazine, but in the suitability of the material with the achievements, learning objectives and the content of the material presented in the form of stories and quizzes validators place the assessment on very valid criteria. According to (Adiari & Agung Susanto Putra, 2023) one of the criteria for good teaching materials is that the learning materials used must be in accordance with the learning objectives that support learning activities in the classroom. In addition, the e-magazine also provides problems in the form of quizzes to make students understand the material presented in the e-magazine better.

Based on the validity test, the e-magazine of human digestive system material based on problem-based learning for primary school science learning is an electronic teaching material that has been said to be very valid to be used as an alternative teaching material source in learning for teachers and students to achieve learning objectives. So that the material presented can vary, can attract students and gain new knowledge and experiences from learning. According to (Nurjanah et al., 2022) that e-books are very effective for use in learning because they can increase students' interest, motivation, and curiosity.

CONCLUSION

Based on the validity test conducted on the problem-based e-magazine of human digestive system material for science learning, the average calculation result is 95% with very valid criteria. It can be concluded that the e-magazine on human digestive system material developed using the problem-based learning model for elementary school science learning has very valid criteria and the problem-based e-magazine on human digestive system material can be used for science learning in elementary schools, especially grade 5.

This study can be developed through further research by conducting further field trial research by implementing the e-magazine in grade V elementary school. Evaluate its impact on students' understanding and interest in learning about the digestive system. Future researchers can further develop the e-magazine by adding interactive materials, such as learning videos or online quizzes, to increase learner engagement.

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