RANGE : Jurnal Pendidikan Matematika
e-ISSN :2685-2373

Volume 6, Nomor 1, Juli 2024, pp. 25-38

Development of Interactive Multimedia Based on ISpring Suite with Corrective Feedback to Improve Student's Conceptual Understanding Ability

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Received: November 11th, 2023. Accepted: January 29th, 2024. Published: July 30th, 2024.

ABSTRACT

The ability to understand mathematical concepts are one of the abilities that must be achieved. Based on the results of the initial test, the conceptual understanding ability of class IX students at one of schools in Magelang are relatively low. The aim of this research was to produce iSpring Suite-based learning multimedia products with valid, practical and effective corrective feedback in improving students' concept understanding abilities. The research belongs to research and development using the Borg and Gall model. The results of the validity test were 88.44% by material experts in the "very valid" category, and 80.77% by multimedia experts in the "very valid" category. The results of the practicality test were based on the results of the student response questionnaire with an average score percentage of 90% in the "very practical" category, then based on the teacher response questionnaire with a percentage of 88% in the "very practical" category, and based on learning implementation questionnaire, the score was 93.33% with the "very good" category. The results of the test involving 32 students based on the N-Gain were 0.71 in the high improvement category, and the Wilcoxon test obtained Z = -4.941. So, interactive multimedia based on ISpring Suite with Corrective Feedback are valid, practical and effective to improve junior high school students' concept understanding skills in quadratic equation material.

Keywords: corrective feedback, iSpring Suite, concept understanding ability, interactive multimedia.

How to Cite: Awala, F. K., Franita, Y. & Hendrastuti, Z. R. (2024). *Development of Interactive Multimedia Based on ISpring Suite with Corrective Feedback to Improve Student's Conceptual Understanding Ability*. *Range: Jurnal Pendidikan Matematika*, 6(1), 25-38.

Introduction

The development of mathematics from year to year continues to increase according to the demands of the times. Because the demands of the times encourage people to be more creative in developing or applying mathematics as a basic science (Sunaryo & Bernard, 2022). The world of education cannot be separated from the existence of learning media. Therefore, there is a need for learning media that is creative and easy to use, such as digital learning media that is used to convey material that is difficult to understand and is abstract (Rinaldi, 2021).

Novitasari (2016) said that several things that cause obstacles in the students' learning process revolve around the abstract characteristics of mathematics, media problems, as well as student problems and teacher problems. In fact, one of the causes of failure in learning mathematics is that students do not understand mathematical concepts or students misunderstand mathematical concepts. The ability to understand concepts is one of the abilities that must be achieved. Based on the results of the initial ability test for understanding concepts carried out on class IX students at one of the State Middle Schools in

Magelang City, the average score of students was obtained at 46.98 with the indicator with the lowest result being the indicator point of presenting concepts in various representations, where students had difficulty in presenting mathematical expressions and explaining concepts sequentially that are mathematical in nature. The average score obtained is included in the low category, because according to (Fajar, Kodirun, Suhar, and Arapu, 2019), the ability to understand concepts in the low category is in the range of scores < 60.

In the learning process, efforts are needed by the teacher to provide opportunities for students to be actively involved in deepening the material and connecting concepts with their respective abilities. Quadratic equations are one of the topics in mathematics given to students in SMP/MTs education units. However, in reality, students are more likely to memorize formulas than understand them when working on problems. The mathematics learning process, which is only carried out by memorizing formulas and definitions, is not completely successful in improving student learning achievement (Putri & Fuadiah, 2019). As for student errors on the subject of quadratic equations, they include conceptual errors, namely students not understanding the use of the concepts used in the material, procedural errors, namely students still making mistakes in carrying out mathematical operations, and operational errors, namely students not being able to determine the procedure or steps in solving question items (Anggraini & Kartini, 2020).

According to Prastiwi, Astawa and Mahayukti (2019), students can understand concepts, build concepts with their own knowledge and practice answering practice questions a lot. This is of course important to be able to facilitate students in independent learning and practice doing practice questions which of course can help students construct their understanding. According to Fajar, Kodirun, Suhar, and Arapu (2019), interactive multimedia can answer the problems in Putri and Fuadiah's research. An interesting activity is needed in presenting practice questions and material, one of which is the use of interactive multimedia where educators can combine text, images, videos, sounds, animations and graphics in designing the learning media used. The use of interactive multimedia can be used to support the learning process which is of course very much needed, especially if it is equipped with practice questions accompanied by feedback.

One form of feedback in the form of clear information or direction is called corrective feedback. According to Kurniawati, Djudin, and Arsyid (2013), teachers can use feedback during learning as an external stimulus. It can be used to discover and correct student misconceptions. Corrective feedback can be done by providing instructions in the form of information to students who make mistakes (Risdianti, Kartono, & Masrukan, 2019). Corrective feedback is one strategy that can be used to respond to the results of formative assessment. Through corrective feedback, students realize where mistakes are located and deepen understanding of the knowledge gained through learning experiences so that learning difficulties

can be overcome and ultimately the quality of learning outcomes becomes better (Novanti, Djudin, & Arsyid, 2017).

Apart from that, computer application-based learning media nowadays is a necessity and can make it easier to support learning. One of the many programs used to create learning media in presenting material is the Power Point program equipped with *iSpring Suite*. According to Ninawati, Burhendi, and Wulandari (2021), the development of *iSpring Suite* software-based teaching materials can be used easily and can be accessed using various devices such as cellphones so that their use is more practical, interesting and economical in accordance with current technological developments. This is because the manufacturing process is easy but can create innovative and interesting work.

Based on the background that has been described, it is necessary to carry out research regarding the development of learning media, especially in the subject of quadratic equations, using the *iSpring Suite* which is packaged in a more attractive format. Therefore, researchers are interested in carrying out development research entitled "Development of Interactive Multimedia Based on iSpring Suite with Corrective Feedback to Improve Middle School Students' Ability to Understand Concepts in Quadratic Equation Material".

Methods

This research aims to produce interactive multimedia products that are valid, practical and effective. The research was carried out in September 2023 with the subjects in this research being 32 class IX students at one of the State Middle Schools in Magelang City and mathematics teachers to obtain data for testing the practicality and effectiveness of the product, as well as material experts and multimedia experts to obtain data for validity testing developed multimedia products.

The type of research used in this research is *Research and Development* (*R&D*) or better known as development research. This development research refers to the *Borg and Gall* development research procedures according to Sugiyono (2013) which are adapted to the needs of researchers. This research uses nine of the ten steps according to *Borg and Gall*.

1. Potential and Problems

This research began by looking for potential and current problems to find out and identify various shortcomings and weaknesses related to the learning media used in the junior high school.

2. Data Collection

From the results of the initial information collection carried out, the next step is for the researcher to carry out planning related to the learning media being developed, in this step, including studying literature related to the problem being studied.

3. Product Design

Based on the data collection that has been obtained, the next stage is product design which includes setting learning objectives, formulating learning materials, and creating a multimedia learning design that is developed with the final product in the form of an HTML file and application.

4. Product Validation

The aim of the development stage is to obtain an initial research and development product in the form of interactive multimedia. In order to achieve this goal, various stages of assessment are needed from experts in the material field and multimedia experts. At this stage, two validation experts were carried out by material experts and media experts.

5. Stage 1 : Product Revision

Product revisions are carried out in accordance with input from media expert validators and material experts. The revised results are initial products that have been validated.

6. Product Trial

The product trial stage in research and development is a small-scale field trial. In this trial, students used interactive multimedia products that had been previously revised. Then at the end students were asked to fill out a questionnaire to find out the response to the product. Researchers analyze the collected data to revise the product.

7. Stage 2: Product Revision

At this stage the researcher revises the multimedia product based on the obstacles that occurred when the product was tested, by analyzing the data that has been collected and carrying out multimedia revisions based on the analysis of student response data.

8. Field Trials

Large-scale field trials or often called large group trials. In this trial, a trial design was used, namely one group pretest posttest, where before students used the product, students did a pretest first and after using the product, students did a posttest. Then at the end students and teachers were asked to fill out a response questionnaire about the multimedia product.

9. Stage 3: Product Revision

This final stage is the final revision in the form of perfecting the product which has gone through the field trial stage and revisions from various parties if any, so that a valid learning multimedia application will

be obtained to support the learning activity process. The development stage is stopped at this step because the final product will not be mass produced.

Data analysis techniques are used to obtain *iSpring Suite* based interactive multimedia products with quality *Corrective Feedback* that meet aspects of validity, practicality and effectiveness. The data analysis technique used in this research is as follows.

Validity analysis calculations are carried out using the following formula (Sugiyono, 2018).

$$P = \frac{\sum validator\ score}{minimum\ total\ score} \times 100\%$$

The following is a table of validity level categories.

Table 1 *Validity Level Criteria*

No	Percentage	Categories
1	80%< score≤ 100%	Very Valid
2	60% < score ≤ 80%	Valid
3	40% < score ≤ 60%	Quite Valid
4	20% < score ≤ 40%	Less Valid
5	0% < score ≤ 20%	Very Invalid

Source: Riduwan (2016)

Based on data Table 1, a product is declared valid for theoretical use if the feasibility percentage is > 61% (Riduwan, 2016).

Practicality analysis calculations are carried out using the following formula (Sugiyono, 2018).

$$P = \frac{\sum \text{validator score}}{m\text{inimum total score}} \times 100\%$$

The following is a table of practicality level categories.

Table 2 *Practicality Level Criteria*

No	Percentage	Categories
1	80%< score≤ 100%	Very Practical
2	60% < score ≤ 80%	Practical
3	40% < score ≤ 60%	Quite Practical
4	20% < score ≤ 40%	Less Practical
5	0% < score ≤ 20%	Very Impractical

Sumber: Riduwan (2016)

A product is considered theoretically suitable for use if the feasibility percentage is greater than 61%, based on the data in Table 2 (Riduwan, 2016). The multimedia effectiveness test was obtained by comparing the pretest and posttest results using the one group pretest-posttest model. The test data results were tested by Paired Sample T-Test if the data was normally distributed and homogeneous. If there is an increase between the pretest and posttest, interactive multimedia is said to be effective (Hermansyah, Basori, & Saidah, 2022). Effectiveness analysis was carried out using the Gain Normality Test. N-Gain

results can be obtained using the following equation (Darmayanti, Wati, Sudirman, Wijaya, and Utami, 2020).

$$N - Gain = \frac{posttest\ score - pretest\ score}{maximum\ score - pretest\ score}$$

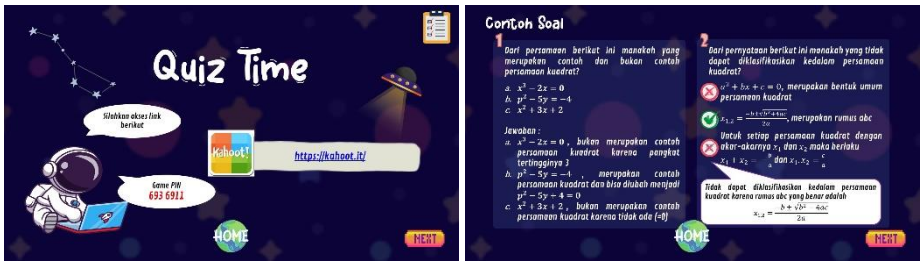
The effectiveness test is interpreted using the standards given in Table 3. According to Darmayanti, Wati, Sudirman, Wijaya, and Utami (2020), interactive multimedia is considered effective and is considered to have increased if the amount of gain obtained is at least in the medium category with a g value ≥ 0.30.

Tabel 3. *N-Gain Tetsting Criteria*

N-Gain (g) score	Criteria
$-1{,}00 \leq g < 0{,}00$	Decline
$g = 0{,}00$	Fixed
$0{,}00 < g < 0{,}30$	Low
$0{,}30 \leq g < 0{,}70$	Medium
$0{,}70 \leq g \leq 0{,}90$	High

Results and Discussion

iSpring Suite based interactive multimedia is a product developed in this research. The following is an overview of the products resulting from the 9 stages of research and development that have been carried out.



Picture 1. *Product Multimedia Interactive*

Product Validity Result

Product validation in the form of interactive multimedia was tested by 3 material experts and 3 media experts. This validation is used to test whether or not *iSpring Suite* based interactive multimedia with *Corrective Feedback* is appropriate in teaching mathematics on quadratic equations. The assessment of each validator refers to the research instrument grid provided. The validation results from material experts and media experts are as follows.

1. Material Expert Validation Results

This material expert validation aims to test the completeness of the material, the suitability of the material, and the systematics of the material. The validation sheet consists of material aspects, construction aspects and language aspects. Validation of the material in the product was assessed by 3 material experts, namely 2 mathematics education lecturers and 1 junior high school mathematics teacher. The results of the material validation data can be seen in the following table.

Table 4 *Material Expert Validation Result*

Validator	Value Given			Average	Kriteria
	Presentation	Content	Language		
Validator 1	26	25	13	85,33%	Very Valid
Validator 2	26	25	12	84%	Very Valid
Validator 3	29	29	14	96%	Very Valid
Average	**90%**	**87,77%**	**86,66%**	**88,44%**	**Very Valid**

The results of the material expert validation data analysis contained in Table 4 show that the material validation level is 88.44% with very valid criteria. Based on these results, the *iSpring Suite* based interactive multimedia with *Corrective Feedback* that was developed meets the requirements for validity and is suitable for use in learning, but still needs improvement based on suggestions from the validator. After validating the material expert's assessment, the input and suggestions are revised according to the material expert's suggestions so that the multimedia is suitable for use.

2. Multimedia Expert Validation Results

This multimedia expert validation aims to test the suitability of the multimedia used. The validation sheet consists of aspects of appearance, programming and media suitability. Validation of multimedia in the product was assessed by 3 multimedia experts, namely 2 mathematics education lecturers and 1 junior high school mathematics teacher. The results of multimedia validation data can be seen in the following table.

Table 5 *Multimedia Expert Validation Result*

Validator	Value Given			Average	Kriteria
	Appearance	Programming	Media Eligibility		
Validator 1	37	24	13	82,22%	Very Valid
Validator 2	35	23	12	77,77%	Valid
Validator 3	37	24	12	81,11%	Very Valid
Average	**80,74%**	**78,88%**	**82,22%**	**80,37%**	**Very Valid**

The results of the multimedia expert validation data analysis contained in Table 4.2 show that the multimedia validation level is 80.37% with very valid criteria. Based on these results, the *iSpring Suite* based interactive multimedia with *Corrective Feedback* that was developed meets the requirements of being valid and suitable for use in learning from a multimedia perspective, but still needs improvement based on suggestions from the validator.

After validating the multimedia expert's assessment, the product is revised according to input and suggestions from the multimedia expert so that the multimedia is suitable for use. The research results show that interactive multimedia based on iSpring Suite with *Corrective Feedback* is declared valid and suitable for use in mathematics learning.

The first aspect of the validity of *iSpring Suite* based interactive multimedia was declared valid by material experts because if we look at several aspects that are assessed starting from the presentation aspect such as the preparation of products that refer to learning objectives and the presentation of material that is interactive and participatory in accordance with the KD that must be achieved. Then, content aspects such as suitability and completeness of the material are considered good because the provision of example questions and practice questions that are presented encourages students' curiosity and the provision of *corrective feedback* on each question can help students improve their ability to understand concepts. This is in line with Muakhirin's (2014) opinion that students can understand concepts if students can construct concepts with their own knowledge and practice a lot in completing practice questions. So if we look at these three aspects, it shows that *iSpring Suite* based interactive multimedia with *Corrective Feedback* is valid according to learning outcomes and can be used to

support the mathematics learning process.

Furthermore, in multimedia validity, namely the relationship between components is declared valid. The components in question include display aspects, programming and media completeness aspects. These three aspects were declared valid by multimedia experts with validity levels of 80.74%, 78.88% and 82.22% respectively. According to expert assessments, *iSpring Suite* based interactive multimedia with *Corrective Feedback* achieves very valid standards overall. The aspect with the highest level of validity is the suitability aspect of the media, where complete examples and practice questions and images are able to support the material, followed by display aspects and programming aspects which are certainly attractive, accompanied by clear instructions so that the media is easy for students to use, as well as ease of accessing each menu. and slides on media.

Research by Sulistyorini and Lestiadi (2022) obtained validity results for *iSpring Suite* based learning media products of 92.37% with very appropriate interpretations from material experts and media experts. Several aspects of the assessment of the two products are similar, however, the multimedia product developed in this research was also assessed based on aspects of interactive multimedia development accompanied by *corrective feedback*. This can be a differentiator from products that have been developed previously.

3. Product Practicality Test Results

Practicality testing is carried out by analyzing the results of response questionnaires filled out by students and teachers. Below are presented the results of filling out the student and teacher response questionnaires.

1. Practicality of Response Questionnaires

Practicality in the response questionnaire obtained from the calculation of the average multimedia practicality score of 90%. This score shows that multimedia is included in the very practical category. Next, an analysis of the results of the teacher response questionnaire was carried out. As for the analysis of the results of the teacher response questionnaire, it was found that the average multimedia practicality score based on the teacher response questionnaire was 88%. This score shows that multimedia is included in the very practical category. Based on the data above, an analysis of the results of the student response questionnaire and the results of the teacher response questionnaire was carried out, and an average practicality level percentage of 89% was obtained in the very practical category.

2. Practicality of Learning Implementation

Apart from practicality testing which was carried out using the results of the response questionnaire, the practicality test also used the results of the learning implementation sheet which showed that learning implementation received a percentage score of 93.33%. These results show that learning using interactive multimedia based on iSpring Suite can be carried out very well. The research results show that interactive multimedia based on iSpring Suite with Corrective Feedback is declared practical and suitable for use in mathematics learning.

The level of practicality of learning multimedia products can be obtained from response questionnaire data and learning implementation observation sheets. Teachers and students fill out questionnaires with answers regarding how enjoyable and easy it is to use the multimedia product. Students gave positive responses with a practicality percentage of 90%, while teachers responded with a percentage of 88%. From the two levels of practicality obtained, interactive multimedia based on iSpring Suite with Corrective Feedback is declared to be very practical. Then, based on data from filling in the learning implementation observation sheet, with a percentage score of 93.33%, it states that all learning activities consisting of preliminary activities, core activities and closing activities have been implemented and run very well.

According to Djamas, Tinedi, and Yohandri (2018) the use of learning media can improve the quality of education and can increase students' level of understanding in understanding the material being taught. Without the help of learning media, the learning process cannot be carried out optimally. However, using learning media can create a new atmosphere in learning so that it can make students happy during the learning process. This is in line with student enthusiasm during learning, which can be seen from student activity. Apart from being able to operate directly, students are also active in answering questions, both working on questions in front of them and in working on quiz questions that have been provided on multimedia. Furthermore, with corrective feedback, students are able to practice their ability to understand concepts, because apart from having lots of practice working on questions, direct feedback can help students understand questions that they find difficult.

Product Effectiveness Test Results

Pretest and posttest results are used to inform effectiveness testing. This test is carried out before testing the effectiveness of a product. Homogeneity and normality tests are relevant prerequisites.

Table 6 Normality Test Result

	Pretest	***Posttest***
Asymp Sig,(2-tailed)	,112	,003

The sig value is obtained from the results of the pretest and posttest normality tests. The posttest was 0.003 and the pretest was 0.112. The homogeneity test was not carried out because H_0 was rejected because the posttest sig value was less than 0.05, which means the data was not normally distributed. The comparison test between two paired samples was carried out after the normality test.

To compare the two samples, the Wilcoxon test was used because the posttest data distribution was not normal.

Tabel 7 *Wilcoxon* Test Result

	Pre-Post
Z	−4,941
Asymp Sig,(2-tailed)	,000

The results of this calculation show a Z_count value of -4.941. The Z_table value=1.96 was found with a confidence level of 5%. Z_count < Z_table value, it can be concluded that there is a striking difference between students' pretest and posttest scores. The N-Gain test is used to measure the increase in students' abilities after differences in pre- and post-test results regarding multimedia use were found. The following table displays the measurement results calculated using the N-Gain formula.

Tabel 8 *N-Gain* Test Result

	Pretest	***Posttest***	***g***	**Criteria**
Rata-rata	59	88	0,71	High

Interactive multimedia built on *iSpring Suite* with *Corrective Feedback* is in the high improvement category as indicated by an average score of 0.71 obtained based on the N-Gain measurement in Table 8. The results show that interactive multimedia built on *iSpring Suite* with *Corrective Feedback* is considered efficient and appropriate for use in mathematics education.

The aspect of students' ability to understand concepts is seen from the increase in scores obtained by students who take the test. This value was obtained through a pretest and posttest on 32 class IX students. The pretest and posttest were given to see the increase in student scores between before and after using multimedia learning. Furthermore, the average pretest score was 58.52 and the average posttest score was 87.78. From these two values, it can be seen that students' scores before and after using multimedia have increased.

The application of the product in this research took place over 3 meetings where before learning to use interactive multimedia, a pretest was carried out, then after completing the learning using interactive multimedia, a posttest was carried out. At the first and second meetings, the material on quadratic equations was discussed with sub-chapters, namely general forms, roots, properties of roots and types of quadratic equations, where at each meeting examples of questions and practice questions were always presented which students could access directly and at the end there was *corrective feedback*. . Then for the third meeting, discussions were held regarding various example questions and application questions to improve students' ability to understand concepts. Thus, increasing the ability to understand the concepts being measured results in high category results. This can be caused by the following factors. First, various types of example questions and interesting practice questions are presented, such as using Kahoot, so that by frequently doing practice questions, students can construct concepts with their own knowledge to the maximum. Second, there is a *corrective feedback* feature on each example question and practice question, which of course really helps students realize where mistakes are located so that students can deepen their understanding of the knowledge they have gained. Thus, it can be concluded that interactive multimedia based on *iSpring Suite* with *Corrective Feedback* is effective in learning quadratic equation material, especially in improving students' concept understanding abilities.

Conclusion

The iSpring Suite based interactive multimedia product with Corrective Feedback was declared valid based on validation results with an average score percentage of 88.44% by material experts, and 80.77% by multimedia experts. Based on the results of the student response questionnaire with an average score percentage of 90% in the very practical category, then based on the teacher response questionnaire with a percentage of 88% in the very practical category, and based on observations of learning implementation, the score was 93.33% in the very good category. Based on the N-Gain results on the pretest and posttest, the multimedia learning effectiveness score was 0.71 in the high improvement category, and the Wilcoxon test obtained a result of Z = -4.941, so there is a significant difference between before (pretest) and after (posttest) the use of multimedia. Therefore, interactive multimedia based on the iSpring Suite with Corrective Feedback is valid, practical, and effective to use to improve junior high school students' ability to understand concepts in quadratic equation material. Furthermore, interactive multimedia must be improved in terms of application formats for various operating systems for backup if one of the devices used has problems.

Acknowledgement

All praise and gratitude to Allah SWT. who has bestowed His grace, so that researchers can complete this research. This research could be completed thanks to assistance from various parties. Therefore, the researcher would like to express his thanks and highest appreciation to the parties who I cannot mention one by one who have helped complete this research.

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