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INNOVATION OF CBL-STEM BASED TEACHING MATERIALS INTEGRATED LEARNING VIDEOS ON CREATIVE THINKING SKILLS

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ABSTRAK

Kemampuan berpikir kreatif siswa di Indonesia tergolong rendah, oleh karena itu perlu adanya tindakan dalam meningkatkan kemampuan berpikir kreatif siswa. Bahan ajar inovatif menjadi salah satu tindakan yang dapat dilakukan. Penelitian ini bertujuan untuk mendeskripsikan proses pengembangan bahan ajar berbasis CBL-STEM terintegrasi video pembelajaran terhadap kemampuan berpikir kreatif siswa kelas VIII. Metode penelitian yang digunakan adalah metode *Research and Development* dengan model 4D yang terdiri dari *define*, *design*, *develop*, dan *disseminate*. Sampel pada penelitian ini yaitu siswa kelas VIII D SMPN 3 Semarang sebagai kelompok kontrol dan kelas VIII E SMPN 3 Semarang sebagai kelompok eksperimen. Teknik pengumpulan data yang digunakan adalah tes dan angket dengan teknik analisis data yaitu teknik analisis deskriptif secara kualitatif dan kuantitatif serta beberapa uji statistik yaitu uji normalitas, uji homogenitas, uji t, uji z, uji kesamaan dua rata-rata, dan uji N-Gain. Penelitian ini memperoleh hasil yaitu persentase skor rata-rata uji kelayakan yaitu 93,30%, persentase skor rata-rata uji keterbacaan yaitu 97,25%, efektif terhadap kemampuan berpikir kreatif siswa, dan persentase skor rata-rata respon siswa yaitu 95,5%. Kesimpulan dari penelitian ini adalah bahan ajar yang dikembangkan sangat layak, mudah dipahami, efektif terhadap kemampuan berpikir kreatif, dan mendapatkan respon yang sangat baik dari siswa. Selanjutnya, saran yang diajukan yaitu bahan ajar yang dikembangkan dapat dijadikan sebagai salah satu bahan ajar di sekolah.

Kata Kunci: bahan ajar, challenge-based learning, kemampuan berpikir kreatif, STEM, video pembelajaran.

ABSTRACT

The creative thinking ability of students in Indonesia is considered low, therefore there is a need for action to enhance their creative thinking skills. One of the actions that can be taken is the development of innovative teaching materials. This research aims to describe the process of developing CBL-STEM-based teaching materials integrated with instructional videos to improve the creative thinking ability of eighth-grade students. The research method used in this study is the Research and Development method with a 4D model, consisting of define, design, develop, and disseminate stages. The samples for this research were eighth-grade students from class D at SMPN 3 Semarang as the control group and class E at SMPN 3 Semarang as the experimental group. Data were collected using tests and questionnaires, and the data analysis employed both qualitative and quantitative descriptive analysis techniques, along with several statistical tests. The results of the study showed that the average score percentage for the feasibility test was 93.30%, the average score percentage for readability test was 97.25%, and the developed teaching materials were effective in improving students' creative thinking ability, with an average response score of 95.5% from the students. In conclusion, the developed teaching materials were deemed highly feasible, easily understandable, effective in enhancing students' creative thinking ability, and received very positive responses from the students. Furthermore, it is

recommended that the developed teaching materials be incorporated into the school curriculum as part of the instructional resources.
Keywords: challenge based learning, creative thinking skills, learning videos, STEM, teaching materials.

How to cite

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INTRODUCTION

The 21st century requires innovation in learning and action systems to increase competence because the 21st century demands quality human resources (Zubaidah, 2018). In preparing Indonesian lessons, several skills must be possessed by Indonesian students' so they can face these challenges. The skills are globally divided into four categories, namely tools for work, ways of working, thinking, and living in the world (Binkley *et al.*, 2010). There are three core subjects of 21st century education, (1) innovation and learning skills (4Cs), (2) information, technology and media skills, and (3) career and life skills (Ayu, 2019). The US-based Partnership for 21st century skills identifies four essential skills for the 21st century, one of which is creative thinking (Supena *et al.*, 2021). Creative thinking is considered a high-level skill that an individual possesses (Rofiah *et al.*, 2013).

However, the creative thinking skills of Indonesian students have not developed well, as creativity is undervalued in the mathematics learning process (Saefudin, 2012). On October 23, 2022, during observations at SMPN 3 Semarang, it was revealed that Class VIII mathematics students still faced difficulties in answering creative thinking questions. This observation is supported by the results of a preliminary study that indicates the low level of creative thinking skills among Grade VIII students at SMPN 3 Semarang. The findings of the preliminary study on students' creative thinking skills are presented in Table 1.

Table 1. Preliminary Study Results on Creative Thinking Ability

Class	Average Creative Thinking Ability
VIII	48,15
VIII	50,94
VIII	50,47
Total Average	49,93

The preliminary study was carried out by giving two items to test students' creative thinking skills: fluency, novelty, and flexibility indicators for material in algebraic forms at three grade VII SMPN 3 Semarang levels. The preliminary study result show that the creative thinking skills of Grade VIII students at SMPN 3 Semarang are still relatively low. The average creative thinking ability of students in each class only reached an interval of 45 to 55 with a total average

of 49.93 out of a maximum score of 100. One of the factors causing the low ability to think creatively among Grade VIII students' at SMPN 3 Semarang is a lack of training for students' creative thinking skills. The result of an interview with a mathematics teacher at SMPN 3 Semarang said one of the contributing factors to the students' low ability creative thinking was the lack of training for students' proficiency in creative thinking during mathematics learning.

Developing teaching materials with the nuances of Science, Technology, Engineering, and Mathematics (STEM) can improve students' creative thinking skills. STEM influence students' creative thinking skills and mathematics achievement (Jawad *et al.*, 2021). Many advantages can be obtained by implementing STEM learning in schools. Integrating STEM into learning is the right thing to implement in Indonesia because it will help teachers convey material in interesting and different ways. The learning model that can be implemented with STEM is the Challenge Based Learning model (CBL). CBL was chosen because this learning model combines project-based learning, problem-based learning, and contextual learning that is focused on solving problems that exist in everyday life to create a space where students can apply creative thinking skills to find solutions to solving challenges that arise. An effective solution to aid students significantly is the implementation of Information and Communication Technology (ICT) in their learning process. It can be said that using ICT in learning mathematics will create interesting learning because students' emotional involvement will greatly affect their memory of the material they are studying. One of the ICT tools that can be used to assist learning is learning videos. Learning videos make student learning outcomes better than conventional learning (Kurniawan, 2016). Learning videos will stimulate students' creative thinking and make them focus on the media (Wulandari *et al.*, 2022).

Based on the results of an interview with one of the mathematics teachers at SMPN 3 Semarang, it appears that students only use textbooks as a learning resource. As said by two grade VIII mathematics teachers, this causes the teacher to make additional learning resources such as learning videos and notes obtained from other learning sources. Consequently, it is imperative to develop teaching materials that utilize easily comprehensible language. Integrating Challenge Based Learning model and nuances of Science, Technology, Engineering, and Mathematics (CBL-STEM) along with learning videos can be an innovation. With CBL-STEM and integrating learning videos it will have an impact on students' creative thinking skills. The formulation of the problem in this research is how the process of developing teaching materials based on CBL-STEM is integrated with learning videos on the creative thinking skills of class VIII students. This research aims is to describe the process of developing teaching materials based on CBL-STEM integrated learning videos for the creative thinking skills of Grade VIII students.

METHOD

The research employs the Research and Development (R&D) method to produce specific products and evaluate their effectiveness. The 4D model, consisting of the define, design, develop, and disseminate stage, was developed by Thiagarajan in 1976. The flow chart of the study is depicted in Figure 1.

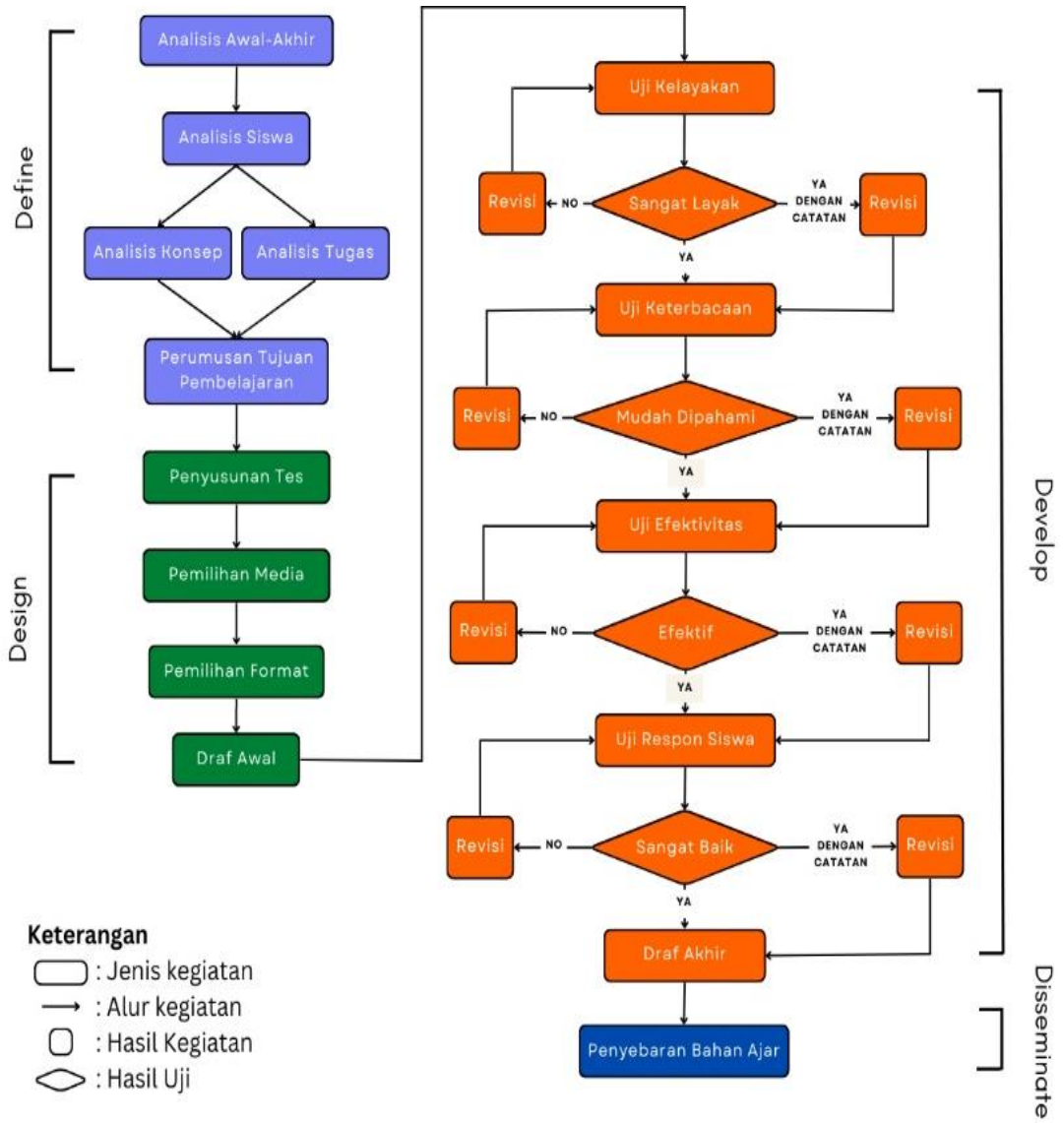

Figure 1. Research Flowchart

The study's population consists of Grade VIII students at SMPN 3 Semarang. The sample selection utilizes the cluster random sampling technique, randomly selecting two classes from the eight available Grade VIII students. The samples selected were class VIII D as the control group and class VIII E as the experiment group.

The data collection technique used to obtain data in this study was a pretest and post-test as well as a questionnaire consisting of a due diligence questionnaire, a readability test questionnaire, and a student response questionnaire. The data analysis technique of this study used a qualitative descriptive analysis technique based on the results of comments and suggestions on the teaching material assessment sheet by the validator and a quantitative analysis technique based on data collected from the feasibility assessment, readability assessment, effectiveness assessment on creative thinking skills and students' responses to the teaching materials developed.

There are several criteria for the feasibility, readability, effectiveness, and student response tests. The criteria for the feasibility, readability, and student response test are shown

in Table 2, Table 3, and Table 4. Teaching materials are declared to fulfil the due diligence test if the percentage score is > 85%. The teaching materials must be revised and revalidated if the percentage score is ≤ 85%. Teaching materials stated that it meets the readability test if the percentage score is > 85%. The teaching materials must be revised and revalidated if the percentage score is ≤ 85%. Teaching materials are declared to fulfil the effectiveness test if they fulfil the five effectiveness tests namely (1) the average post-test score of the experimental group achieves completeness according to KKM, which is more than 75, (2) the proportion of students who achieve learning completeness is more than 70%, (3) the average post-test score of the experimental group is more than the average score post-test control group, (4) the results indicate a significant improvement in students' creative thinking skills, as evidenced by a higher average post-test score compared to the average pretest score in the experimental group, and (5) the average increase in creative thinking skills for the experimental group surpassed the average increase in the control group's creative thinking skills. The teaching materials are acceptable if the score is > 85% on the readability test, the teaching materials must be revised and revalidated if the score is ≤ 85%.

Table 2. Feasibility Level Criteria

Eligibility Level	Criteria
$1\% < S \leq 50\%$	Not feasible
$50\% < S \leq 70\%$	Fairly feasible
$70\% < S \leq 85\%$	Feasible
$85\% < S \leq 100\%$	Very Feasible

(Table Source: Ardiansyah and Pratama, 2021)

Table 3. Readability Level Criteria

Readability Level	Criteria
$1\% < S \leq 50\%$	Difficult to understand
$50\% < S \leq 70\%$	Less understood
$70\% < S \leq 85\%$	Pretty easy to understand
$85\% < S \leq 100\%$	Easy to understand

(Table Source: Ardiansyah and Pratama, 2021)

Table 4. Student Response Criteria

Student Response Level	Criteria
$1\% < S \leq 50\%$	Bad
$50\% < S \leq 70\%$	Enough
$70\% < S \leq 85\%$	Good
$85\% < S \leq 100\%$	Very good

(Table Source: Sa'dun, 2016)

RESULTS AND DISCUSSION

1. Define

During the define stage several activities take place, including (1) initial and final analysis, (2) analysis of the students' characteristics, (3) analysis of the concept, (4) task analysis, and (5) formulation of learning objectives. In the initial and final analysis interviews were conducted with several mathematics teachers at SMPN 3 Semarang. The fidings from interviews conducted with two math teachers at SMPN 3 Semarang show that there is still a

lack of resources for learning mathematics, the CBL model has never been applied to learning, STEM learning is rarely implemented, and there is a lack of application of learning that trains students' creative thinking skills. This is supported by the outcomes of preliminary studies conducted by the researchers. The preliminary study results show that the creative thinking ability of Grade VIII students has a total average of 49.93 out of a scale of 100, which is classified as very low.

In the student analysis, interviews were conducted with several mathematics students at SMPN 3 Semarang. The results of interviews with three grade VIII students at SMPN 3 Semarang show that mathematics is a lesson that is less attractive to students. One reason is the difficulty in understanding the formulas in the learning resources. Understanding the formulas makes it difficult for students to solve the available problems. The three interviewed students also stated that only textbooks were the learning resources obtained from school. It makes students look for other independent learning resources to help them understand the learning material. The results of the interviews also show that group learning and CBL with STEM nuances make students' interested in and challenged to complete them.

The concept analysis obtained material that will be implemented in teaching materials. The material chosen is Sistem Persamaan Linear Dua Variabel (SPLDV) for odd-semester class VIII SMP/MTs students. Basic Competency in this teaching material is presented in Table 5.

Table 5. Basic Competency

	Basic Competency
3.5	Describes a system of two-variable linear equations and their solutions related to contextual problems.
4.5	Solve problems related to systems of two-variable linear equations.

In the task analysis, the assessment of the developed teaching materials lies in the challenges and assessments. Challenges are given to students in the form of projects and observations of the environment around the school. The assessment contains problems regarding two-variable linear equations and a two-variable linear equation system. In addition, the assessment also contains problems related to STEM nuances. In the teaching materials developed, guiding questions and activities can also be used as an assessment aspect. Indicators of competency achievement that will be implemented in teaching materials are presented in Table 6.

Table 6. Competency Achievement Indicators

	Competency Achievement Indicators
3.5.1	Analyze the concept of linear equation two variable
3.5.2	Make a mathematical model of a contextual problem related to a system of two-variable linear equations.
4.5.1	Solve contextual problems related to systems of two-variable linear equations with various methods

In the analysis of learning objectives, learning objectives are derived from Core Competencies and Basic Competencies in the 2013 curriculum, along with competency

achievement indicators formulated by previous researchers. The learning objectives that will be implemented in teaching materials are presented in Table 7.

Table 7. Learning Objectives

Learning Objectives
Through CBL STEM-based learning integrated with learning videos, students can think creatively 1. correctly analyze the concept of linear equations of two variables 2. make mathematical models of contextual problems related to systems of two-variable linear equations correctly, and 3. correctly solve contextual problems related to systems of two-variable linear equations with various methods.

An innovation that can be made to help students understand learning material is to develop CBL STEM-based teaching materials integrated with learning videos on students' creative thinking skills. The researcher developed the teaching material on a system of two variable linear equations. This innovation utilizes teaching materials. One of the benefits of using teaching materials in learning is to increase effectiveness and improve the quality of learning (Gazali, 2016). In making teaching materials, we need to pay attention to the depth and breadth of the scope of teaching materials adapted to the conditions of students' initial skills and learning objectives (Bahtiar, 2015).

2. Design

During this stage, various activities were undertaken, including (1) test preparation, (2) media selection, (3) format selection, and (4) initial drafting. In the test preparation activity, a test grid was obtained which was prepared according to the findings of the analysis during the define stage and adapted to the students' creative thinking skills. At the media selection stage, learning media are selected as of teaching materials that can be used in hard or soft files. This innovative teaching material is specifically designed by combining a challenge-based learning model with the nuances of science, technology, engineering, and mathematics integrated with learning videos. Integrating learning videos is an innovative thing in these teaching materials. Students can listen to learning videos by scanning the barcodes available in teaching materials. With this teaching material, it is expected to have a positive impact or influence on the ability to think creatively. In choosing the format, the teaching materials developed include several format choices, namely (1) the font used is Comic Sans MS for sentences and Cambria Math is used for equations, (2) the font size is 11, (3) the paper size is B5, (4) the spacing between lines is 1.15, (5) teaching materials are arranged based on the syntax of the CBL model, (6) the teaching materials are divided into three main parts, introduction, content, and closing. Next is the preparation of the initial draft of teaching materials. In this section, the results of the initial design or initial draft of the teaching materials developed by the researcher are obtained.

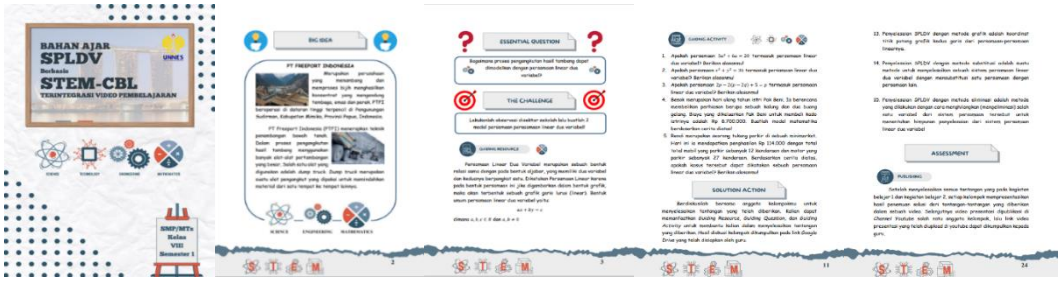

Figure 2. First draft of teaching

CBL STEM-based teaching materials integrated with learning videos related to Piaget's learning theory. In the learning process with these teaching materials, students will experience assimilation and accommodation to guiding resources, guiding questions, guiding activities and challenges with the nuances of science, technology, engineering and mathematics provided. Assimilation refers to aligning of incoming information with a person's existing thought structure. In contrast, accommodation occurs when the received information does not fit the individual's current thinking structure, leading to a cognitive imbalance. It prompts the person to feel a strong urge to adjust their thought structure to achieve harmony and balance with the new information (Sutawidjaja & Afgani, 2015). In addition, teaching materials based on CBL-STEM integrated learning videos are also related to Vygotsky's learning theory. Guiding resources, questions, and activities on teaching materials is one way for teachers to is one way for teachers can assist students in comprehending the learning material. It is to the scaffolding theory because the teacher has an important role as a provider of assistance in the form of certain techniques and skills that are beyond the ability of students (Sutiarso, 2009). Ausubel's learning theory of meaningful learning is also relates to CBL STEM-based teaching materials integrated with learning videos. The CBL model and STEM nuances in teaching materials will provide meaningful learning for students. With the knowledge that students learn, they can understand new concepts and solve problems by transferring their knowledge to new situations and problems (Gazali, 2016).

3. Develop

At the development stage, several tests were carried out, namely (1) a test of feasibility, (2) a test of readability, (3) a test of effectiveness, and (4) test of student response. In the feasibility test of SPLDV teaching materials based on CBL-STEM integrated learning videos, it was carried out by four mathematics lecturers at Universitas Negeri Semarang and one mathematics lecturer at Universitas Kristen Satya Wacana as experts and five mathematics teachers at the junior high school level as practitioners. The feasibility test evaluates four aspects: content feasibility, presentation feasibility, linguistic aspects, and learning innovation. Teaching materials developed by researchers are declared feasible if they meet very feasible criteria.

The due diligence results of the five experts and five practitioners were recapitulated and the average due diligence results were obtained. The summarized outcomes of the evaluation conducted by five experts and five practitioners on the teaching materials are presented in Table 8. Developed teaching materials received a final average score of 93.30%, indicating very feasible. Given the very feasible rating, the teaching material did not undergo

re-testing, instead, they were revised based on suggestions and feedback provided by the validator.

Table 8. Recapitulation of feasible test

Evaluator	Feasible (%)				Final Score	Criteria
	Content	Presentation	Language	Learning Innovation		
A01	90,63	93,33	96,43	100	93,75	Very Feasible
A02	95,83	96,67	94,64	100	96,25	Very Feasible
A03	91,67	95	92,86	92,86	92,92	Very Feasible
A04	92,71	93,33	91,07	89,29	92,08	Very Feasible
A05	94,80	96,67	96,43	92,86	95,42	Very Feasible
P01	94,80	96,67	92,86	92,86	94,6	Very Feasible
P02	88,54	95	94,64	89,29	91,67	Very Feasible
P03	92,71	95	92,86	92,86	93,34	Very Feasible
P04	94,80	96,67	94,64	96,43	95,42	Very Feasible
P05	85,42	88,33	91,07	85,71	87,5	Very Feasible
Average	**92,19**	**94,67**	**93,75**	**93,21**	**93,30**	**Very Feasible**

Considering the comprehensive feasibility test result, the final percentage score of 93,30% indicates very feasible. The results of the feasibility test for this study are from previous studies. Previous research on STEM-based teaching materials aimed at improving high school students' concept mastery achieved a feasibility score of 83.57% (Pangesti *et al.*, 2017). Another study that developed mathematics learning videos using the Sparkoll Videoscribe application attained a final score of 78.4% (Fadillah & Bilda, 2019).

Ten grade IX SMP/MTs students completed the readability test by filling out a questionnaire the researcher gave. Aspects of readability include the use of language, writing, presentation, and density of ideas. The readability test result for the researchers'' developed teaching materials, as depicted in Figure 2, revealed a final score of 97.25%, signifying that the materials are easy to understand. The readability test also provided valuable comments and suggestions for further improvement. As for the comments and suggestions of students, namely (1) it is good and interesting even though the colours are not bright but that's each individual's taste, (2) the book is good and easy to understand for junior high school children and is equipped with unique pictures, and (3) it is good.

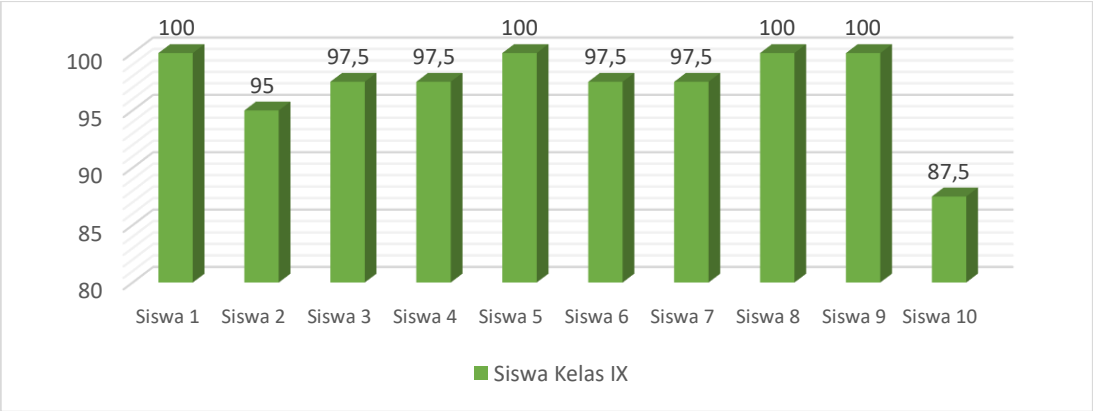

Figure 3. Teaching Materials Readability Results

The results of the readability test in this study are from previous studies. The first research is on developing ethnomathematics teaching materials integrated with challenge-based learning and GeoGebra on problem solving skills which get a readability score percentage of 94% (Ardiansyah *et al.*, 2022). In addition, research related to STEM based teaching materials to improve high school students' mastery of concepts obtained a readability score percentage of 82.17% (Pangesti *et al.*, 2017). Another study examined the effectiveness of using contextual-based teaching materials assisted by learning videos for mechanical engineering vocational schools on electrochemical material with a readability score of 88.71% (Widodo, 2017).

In the effectiveness test, teaching materials were declared effective if they fulfilled the five hypotheses, namely (1) the average post-test score of the experimental group achieves completeness according to KKM, which is more than 75, (2) the proportion of students who achieve learning completeness is more than 70%, (3) the average post-test score of the experimental group is more than the average score post-test control group, (4) the results indicate a significant improvement in students' creative thinking skills, as evidenced by a higher average post-test score compared to the average pretest score in the experimental group, and (5) the average increase in creative thinking skills for the experimental group surpassed the average increase in the control group's creative thinking skills. The effectiveness result is presented in Table 9.

Table 9. Effectiveness test result

Result	Conclusion
$t_{count} = 2{,}55$ and $t_{table} = 1{,}699$ so $t_{count} > t_{tabel}$	The average posttest results of creative thinking skills of experimental class students have reached the KKM which is 75.
$z_{count} = 4{,}36$ and $z_{table} = 1{,}64$ so $z_{count} > z_{table}$	The percentage of experimental class students who completed creative thinking skills has reached 70%.
$t_{count} = 2{,}33$ and $t_{table} = 1{,}67$ so $t_{count} > t_{table}$	The average posttest score of creative thinking skills of experimental class students is more than the average posttest score of creative thinking skills of control class students.
$t_{count} = 3{,}23$ and $t_{table} = 1{,}67$ so $t_{count} > t_{table}$	The average posttest score of creative thinking ability of experimental class students is more than the average pretest score of creative thinking ability of experimental class students.
$t_{count} = 2{,}56$ and $t_{table} = 1{,}67$ so $t_{count} > t_{table}$	The average increase in creative thinking ability of experimental class students is more than the average increase in creative thinking ability of control class students.

The results of the effectiveness test carried out are relevant to previous research. The first relevant research is related to mathematics learning based on settings challenge-based learning on creative thinking skills (Ardiansyah *et al.*, 2018). This research shows that

challenge-based learning has a positive or effective impact on improving students' creative thinking skills. In addition, another piece of research related to the effectiveness of STEM LKS to train students' creative thinking skills (Pertiwi *et al.*, 2017). This research shows that STEM implementation is effective in increasing students' creative thinking skills. Furthermore, research related to the application of the open ended problems model assisted by learning videos can improve students' thinking skills (Wulandari *et al.*, 2022). This research shows that learning that integrates learning videos effectively increases students' creative thinking skills.

The student response test was conducted on 30 students from the experimental class, specifically class VIII E of SMPN 3 Semarang, to gauge their feedback on the teaching materials developed by the researchers. The outcomes of the students' responses to the teaching materials demonstrated an average percentage of 95.5%, indicating a positive response. The student response questionnaire results are presented in Figure 4.

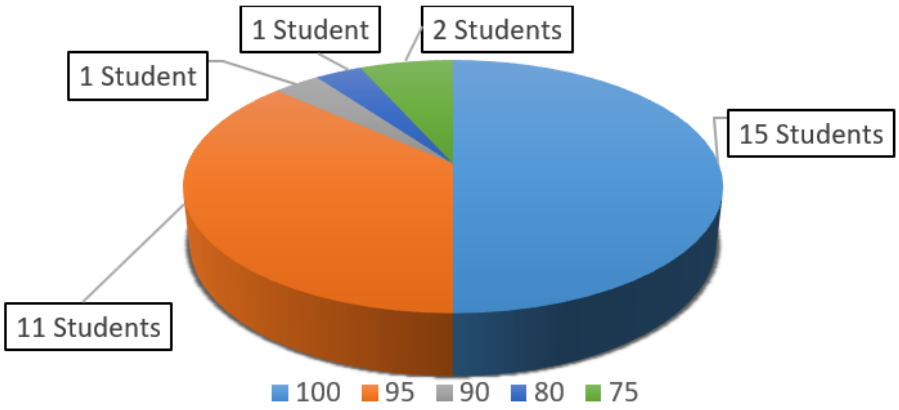

Figure 4. Student Response Test Results

The previous study supports the findings of highly positive student responses to SPLDV teaching materials based on CBL-STEM integrated learning videos. The first relevant research is building places of worship in Cirebon as an innovation in integrated teaching materials with challenge-based learning with ethnomathematics nuances (Ardiansyah *et al.*, 2022). The findings of this study indicate that the integrating the challenge-based learning model in the development of teaching materials receives highly positive feedback from students who have utilized these materials. Subsequent relevant research examines the effect of using instructional video media to reduce students' mathematical misconceptions (Heryandi *et al.*, 2022). This research shows that learning with the help of learning videos gets a good response from students who have used it. he final draft of CBL-STEM-based SPLDV teaching materials integrated with learning videos can be seen in Figure 5.

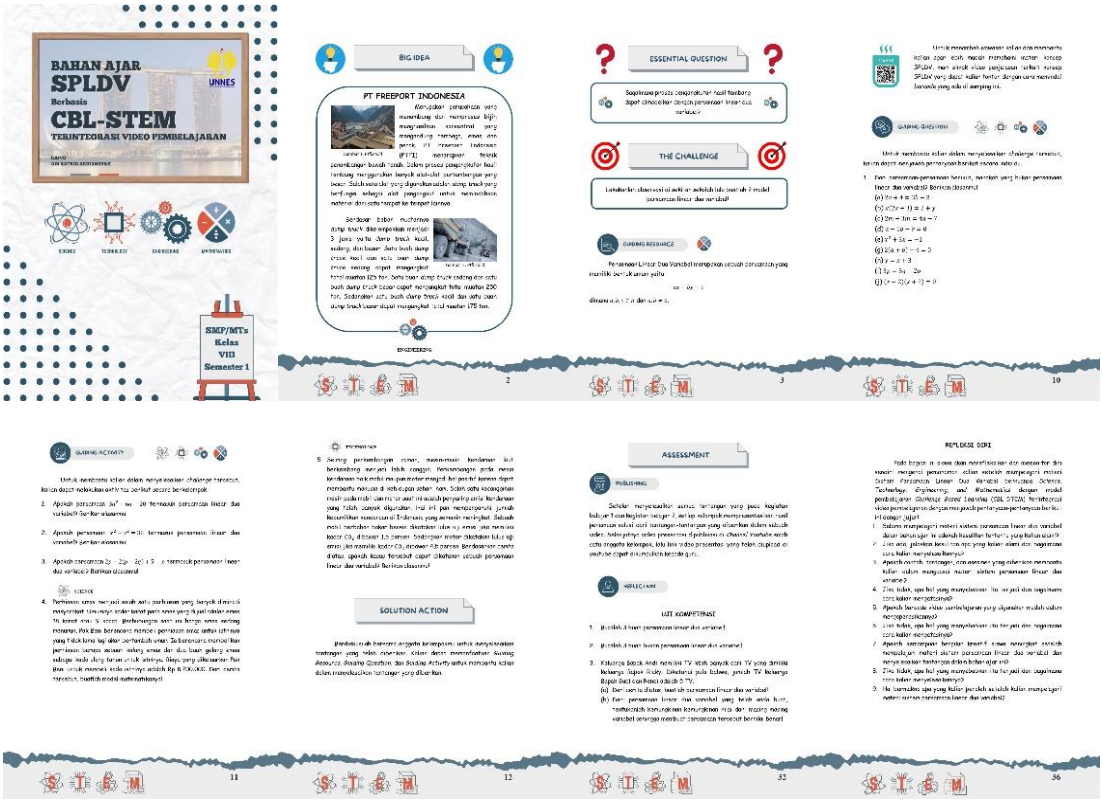

Figure 5. Final draft of teaching materials

4. Disseminate

After the teaching materials were declared very feasible to use, easy to understand, effective on students' creative thinking skills, and received very good responses from students. Furthermore, teaching materials are submitted as Hak Kekayaan Intelektual (HKI). Furthermore, the completed version of the developed teaching materials was introduced to math teachers at SMPN 3 Semarang to make them available as a student learning resource, particularly for the topic of systems of two-variable linear equations. It aligns with the definition of teaching materials, as a source of learning, in which teaching materials are arranged systematically based on learning objectives, learning strategies, and student characteristics to achieve certain skills and competencies (Cahyadi, 2019).

CONCLUSION

The teaching materials developed had taken into account the breadth and depth of the content adapted to the starting condition of the students and the intended learning outcomes. From the results of the selection of media and formats, an initial draft of a CBL STEM-based teaching material integrated with video learning was obtained. Furthermore, the teaching materials are tested for feasibility, readability, effectiveness, and student responses. The average percentage of the feasibility score of the five experts and the five practitioners is 93.30% with very feasible criteria. The average percentage score of readability is 97.25% with easy to-understand criteria. The CBL-STEM integrated learning videos for teaching SPLDV have proven effective in enhancing students' creative thinking skills. It is evident from the effectiveness test results, which show that (1) the average posttest scores of creative thinking ability in the

experimental class have reached the Minimum Mastery Criteria of 75, (2) 70% of students in the experimental class have achieved proficiency in creative thinking, (3) the average posttest scores of creative thinking skills in the experimental class surpassed those of the control class, (4) the average posttest scores of creative thinking skills in the experimental class were higher than the average pretest scores, and (5) the average improvement in creative thinking skills of the experimental class students exceeded that of the control class students. Additionally, the teaching materials received a highly positive student response, with an average percentage score of 95.5%. After the teaching materials have met the feasibility, readability, effectiveness, and student response tests, the teaching materials are disseminated by offering them to schools so that they can be used as one of the student learning resources. Moreover, the proposed recommendations suggest that the developed teaching materials can be valuable learning resources in educational institutions

REFERENCES

Ardiansyah, A.S. et al. (2022). Pengembangan bahan ajar bernuansa etnomatematika terintegrasi challenge based learning dan geogebra terhadap kemampuan pemecahan masalah. *SANTIKA: Seminar Nasional Tadris Matematika*, 2, 45–65. Retrieved from https://proceeding.uingusdur.ac.id/index.php/santika/article/view/1096

Ardiansyah, A.S., Junaedi, I. and Asikin, M. (2018). Student's creative thinking skill and belief in mathematics in setting challenge-based learning viewed by adversity quotient. *Unnes Journal of Mathematics Education Research, 7(1),* 61-70. https://journal.unnes.ac.id/sju/ujmer/article/view/24217

Ardiansyah, A.S. and Pratama, N.T. (2021). Belajar dan berwisata melalui objek wisata bledug kuwu pada bahan ajar materi barisan. *JURING (Journal for Research in Mathematics Learning)*, 4(4), 319-330. https://doi.org/10.24014/juring.v4i4.14115

Ayu, P. E. S. (2019). Keterampilan belajar dan berinovasi abad 21 pada era revolusi industri 4.0. *Purwadita: Jurnal Agama dan Budaya, 3(1)*, 77–83.

Bahtiar, E.T. (2015). *Penulisan bahan ajar*. IPB

Binkley, M. et al. (2012). *Defining twenty-first century skills*. In: Griffin, P., McGaw, B., Care, E. (eds) Assessment and Teaching of 21st Century Skills. Springer, Dordrecht. https://doi.org/10.1007/978-94-007-2324-5_2

Cahyadi, R.A.H. (2019). Pengembangan bahan ajar berbasis addie model. *Halaqa: Islamic Education Journal, 3(1)*, 35–42. https://doi.org/10.21070/halaqa.v3i1.2124

Fadillah, A. and Bilda, W. (2019). Pengembangan video pembelajaran matematika berbatuan aplikasi sparkoll videoscribe. *Jurnal Gantang*, 4(2), 177–182.

Gazali, R.Y. (2016). Pengembangan bahan ajar matematika untuk siswa SMP berdasarkan teori belajar Ausubel. *PYTHAGORAS: Jurnal Pendidikan Matematika*, 11(2), 182-192. https://doi.org/10.21831/pg.v11i2.10644.

Heryandi, Y., & Nur`aini, N. (2022). Pengaruh penggunaan media video pembelajaran untuk mereduksi miskonsepsi matematika siswa. *Integral: Pendidikan Matematika*, 13(1), 13–25. https://doi.org/10.32534/jnr.v13i1.3108

Jawad, L.F., Majeed, B.H. and Alrikabi, H.T.S. (2021). The impact of teaching by using STEM approach in the development of creative thinking and mathematical achievement among the students of the fourth scientific class. *International Journal of Interactive Mobile Technologies*, 15(13), 172–188. https://doi.org/10.3991/ijim.v15i13.24185

Kurniawan, D.T. (2016). Pengaruh penggunaan media video pembelajaran terhadap prestasi belajar ilme pengetahuan sosial siswa kelas V SD Se-Kecamatan Gedangsari Gunungkidul tahun ajaran 2015/2016. *Trihayu: Jurnal Pendidikan Ke-SD-an*, 3(1), 21–26.

Pangesti, K.I., Yulianti, D. and Sugianto (2017). Bahan ajar berbasis STEM (science, technology, engineering, and mathematics) untuk meningkatkan penguasaan konsep siswa SMA. U*nnes Physics Education Journal*, 6(3), 53–58.

Pertiwi, R.S., Abdurrahman and Rosidin, U. (2017). Efektivitas LKS STEM untuk melatih keterampilan berpikir kreatif siswa. *Jurnal Pembelajaran Fisika*, 5(2), 11–19.

Rofiah, E., Aminah, N.S. and Ekawati, E.Y. (2013). Penyusunan instrumen tes kemampuan berpikir tingkat tinggi fisika pada siswa SMP. *Jurnal Pendidikan Fisika Universitas Sebelas Maret*, 1(2), 17–22.

Sa'dun. (2016). *Instrumen perangkat pembelajaran*. Remaja Rosdakarya.

Saefudin, A.A. (2012). Pengembangan Kemampuan berpikir kreatif siswa dalam pembelajaran matematika dengan pendekatan pendidikan matematika realistik indonesia (PMRI). *Al-Bidayah*, 4(1), 37–48.

Supena, I., Darmuki, A. and Hariyadi, A. (2021). The influence of 4C (constructive, critical, creativity, collaborative) learning model on students' learning outcomes. *International Journal of Instruction,* 873–892. https://doi.org/10.29333/iji.2021.14351a

Sutawidjaja, A. and Afgani, J. (2015). Konsep dasar pembelajaran matematika. *International Journal of Interdisciplinary Social Sciences*, 4(9), 51–57. https://doi.org/10.18848/1833-1882/cgp/v04i09/51542

Sutiarso, S. (2009). *Scaffolding dalam pembelajaran matematika*. In Pendidikan dan Penerapan MIPA (pp. 527–530). Universitas Negeri Yogyakarta

Widodo, W. (2017) Efektifitas penggunaan bahan ajar berbasis kontekstual berbantuan video pembelajaran untuk SMK Teknik Mesin pada materi elektrokimia. P*rosiding Seminar Pend. IPA Pascasarjana UM*, 2(3), 365–372.

Wulandari, P., Putra, D., & Faradita, M. (2022). Penerapan model open ended problems berbantuan video pembelajaran untuk meningkatkan kemampuan berpikir kreatif siswa kelas 2 SD Muhammadiyah 3 Surabaya. *Autentik: Jurnal Pengembangan Pendidikan Dasar*, 6(1), 18-32.

Zubaidah, S. (2018). Mengenal 4C: Learning and innovation skills untuk menghadapi era revolusi industri 4.0. *Proceeding in 2nd Science Education National Conference*, (October 2018), pp. 1–18.