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Linear Motion Materials on Authentic Learning in Collaborative Problem-Solving Model: Validity Aspects

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Abstract: The collaborative problem-solving model has advantages in providing facilities for individuals to work effectively in a group and apply their problem-solving skills in various situations and conditions. Problem-solving and collaboration skills are needed in the physics learning process, yet a lack of authentic learning-based resources and inappropriate learning models causes students to struggle to grasp the subject and solve issues collaboratively. The study aims to describe the theoretical validity of the development product in the form of authentic learning-based linear motion teaching materials using a collaborative problem-solving model. The Research and Development model used is ASSURE. The data was obtained through the validation sheet of teaching materials assessed by three validators. The validation findings indicate that the generated instructional materials are very valid, with an average score of 3.55. Thus, it is concluded that the linear motion teaching material based on authentic learning using a collaborative problem-solving model can be tested in the learning process. Thus, the developed teaching materials can be tried out in classroom learning and used as a learning resource for students to solve problems collaboratively.

Keywords: Authentic learning; Collaborative problem solving; Linear motion materials; Validity

Introduction

Physics learning has developed fast in recent years, notably boosting the curriculum quality and intricacy. This development is one method to respond to current expectations that students can think critically to solve issues (Bogaerds et al., 2021). As a result, physics learning is primarily concerned with developing students' problem-solving skills in a structured manner (Dhillon et al., 2020). Problem-solving has been recognized as a critical skill that students lack in the current education system (Chiu et al., 2022).

Solving or attempting to solve problems is thought's typical and general function (Bagassi et al., 2020). Problem-solving, according to Fathani (2018), is an endeavor that encourages students to seek answers by starting with grasping the problem and ending with conclusions as a solution. The problem can help students improve their analytical abilities and use them in different situations (Alfayez et al., 2022). In order to attain the optimum answer to the difficulties at hand, problem-solving learning activities must be supported by other skills. Collaboration is one of the skills that students must possess to address challenges (Primadiati et al., 2017). Collaborative problem-solving (CPS) competency is critical in the twenty-first century (Tang et al., 2021). Consequently, students nowadays are expected to master these skills as the first step in solving real-life physics issues (Septarianto et al., 2022).

The collaborative problem-solving model has advantages in providing facilities for individuals to work effectively in a group and apply their problem-solving skills in various situations and conditions (Hikmah et al., 2020). In addition, the comparison of the advantages and disadvantages of collaborative problem solving with conventional learning is specifically described in Table 1.

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Table 1. The Advantages and Disadvantages between Collaborative Problem Solving and Conventional Models

Model	Collaborative Problem-Solving	Conventional
Advantages	1. Students have the opportunity to learn to solve problems in groups 2. Learners can share the workload effectively 3. Students can increase creativity as a result of the stimulus from the ideas of other group members 4. Learners gain more knowledge because of the interaction between group members 5. Learners become more courageous and trained in expressing opinions	1. Every student has the same opportunity to listen to the teacher's explanation 2. The contents of the syllabus can be completed easily because the subject matter has been arranged in a coherent manner
Disadvantages	1. Requires relatively longer time 2. Learners need to adjust their learning conditions first 3. Students who have difficulty adjusting sometimes find it difficult to solve problems	1. There are difficulties in keeping students focused on the material being studied 2. Learners tend to be passive in learning activities 3. Students tend to only memorize the material without understanding it 4. The absorption of students in the subject matter is less than optimal

Hamzah et al. (2019) stated that six benefits of learning models apply collaborative activities in the process, namely: Increasing the knowledge of group members because interactions in a group influence the mastery of each student's concept, Students can learn how to solve problems in group discussions, Foster a sense of togetherness in students, Increase courage, come up with ideas or opinions in solving problems together, Fostering a sense of individual responsibility in achieving common goals. Each student sees himself or herself as part of a group that feels a commitment that is manifested in the sense of togetherness in learning.

Table 2. Steps of the Collaborative Problem-Solving Model

Stages	Teacher Activities	Student Activities
Engagement	1. The teacher divides the students into several groups.	1. Students gather according to the group division determined by the teacher.
Exploration	2. The teacher gives an authentic problem 3. The teacher acts as a motivator as well as a mentor	2. Students in each group try to understand the authentic problems given by the teacher 3. Students in each group coordinate in taking on their roles and duties to make problem-solving plans
Transformation	4. The teacher acts as a guide	4. Students in each group carry out problem-solving that has been prepared
Solution	5. The teacher acts as a guide	5. Students in each group re-examine each step of problem-solving
Presentation	6. The teacher acts as a trainer	6. Each group presents the results of the discussion related to the authentic problem being discussed
Reflection	7. The teacher acts as a facilitator	7. Each group asks each other about the results of the presentation

A preliminary study that was conducted by interviewing a senior high school teacher in Banjarmasin showed that students struggled to grasp the physics information in the textbooks, making them less able to solve issues on physics topics. It was also seen from the test carried out at the school on the issue of linear motion. Results showed that the students have difficulty answering exam questions correctly, particularly those that need problem-solving reasoning skills. One of the causes is the lack of relevant teaching materials for them. The school only lends out books with limited resources, and the contents do not represent the occurrences in students' life. Other information was gathered on students' lack of engagement in learning activities, hampered their ability to interact and work with one another. Lack of engagement in learning activities influences learning outcomes and how students respond to issues (Okkinga et al., 2018).

A previous study by Gokalp (2018) concerning multidimensional perceptions of physics revealed that undergraduate and graduate physics perceived that physics differs from what it is. However, they generally see physics as something that helps them understand nature. Gokalp (2018) further pointed out that it is important to know how people perceive physics to design physics learning to be more effective, engaging, and formative. Physics content tends to be abstract in terms of ideas. The possibility of abstract ideas that

students perceive possibly occurs on linear motion material. It is not impossible to contribute to students' lack of comprehension of the topic being studied. Even though mastery of a topic is the foundation for solving issues, they cannot uncover the content and purpose when studying the information provided at school (Aritonang et al., 2019). Thus, a proper strategy must be followed for students to get far more familiar with physics topics by presenting them in authentic learning-based teaching materials.

In learning physics at school, students still have difficulty understanding the basic concepts because they think that physics lessons are only centered on memorizing formulas without perceiving the essence of the material. There are still many students who are not able to solve problems systematically, find it difficult to digest the core of the question, find it difficult to determine physical quantities and symbols, and are constrained in understanding concepts, principles, theories, laws, and formulas used to solve a problem (Vera, 2021). In addition, there are obstacles for students to find correlations between physics material and relevant events in their lives, causing the learning process to be less meaningful.

Meaningfulness in learning activities can be interpreted as the ability of students to apply the knowledge gained from learning to solve problems that can be encountered in real life (Ridho et al., 2020). The physics learning process will be more meaningful if the learning facilities or references are taken from daily activities in the students' living environment (Oktaviana et al., 2017). One solution to translate physics material into real phenomena in students' lives is to apply authentic learning.

Authentic learning is an approach to teaching based on real-life situations, allowing students to explore issues and construct meaningful concepts from phenomena or problem solutions pertinent to them (Lombardi, 2007; Pratiwi, 2016; Sulistiani, 2018). This approach makes it simpler for students to connect physics material to real-life experiences, encouraging them to project the abstract realm into a more tangible and engaging one. Indeed, the subject matter in students' daily lives gives valuable experiences and makes it easier for them to tackle problems (Rodríguez-Antón et al., 2020).

In other words, authentic learning can also be represented through the learning resources used, one of which is teaching materials. Authentic learning criteria in teaching materials include various elements such as actual material, the language is explained straightforwardly, the content is easy to interpret by students, closely related to the needs and daily lives of students, and the concepts can be recognized and found in real situations, adaptive, and motivate learning (Yasini, 2019).

The main characteristics of authentic learning are the correlation between learning and real life, triggering students to think at higher levels, the encouragement to explore, interdisciplinary learning (problem-solving approaches through the point of view of relevant science), and the outputs that can be generated and shared by students. Students and learners perform scaffolding techniques (main framework techniques), which can be interpreted as educators gradually providing students' understanding (Maharani et al., 2021). There are ten components in the form of important guidelines in authentic learning (Sebayang et al., 2022), namely: (1) Real-world relevance, meaning that the learning materials presented are relevant and related to real life; (2) Defining the problem, meaning that students identify the problem themselves to obtain a solution; (3) Investigation, meaning that learning activities require students to investigate problems within a certain period of time; (4) Reviewing sources and perspectives, meaning that learning activities are able to encourage students to examine solutions using resources and perspectives in solving problems; (5) Collaboration, meaning that cooperation and cohesiveness are important in learning to make it easier for students to understand a concept or solve a problem; (6) Reflection (metacognition), meaning that there are options for students to reflect on learning individually or in groups; (7) Interdisciplinary perspective, meaning that problem solving approaches in authentic learning can be obtained from various integrated understandings; (8) Integrated assessment, meaning that the assessment is not only for summative activities, but is reviewed more specifically by displaying the process in real terms; (9) Meaningful output, meaning that authentic learning provides results in the form of valuable knowledge for students; (10) Varied results, meaning that authentic learning allows the emergence of various interpretations of students' creative views on a problem.

Authentic learning is expected to make it easier for students to connect the basic concepts of physics material with events or phenomena in everyday life to practice problem-solving skills in solving the physics problems presented. In addition, authentic learning can play a more optimal role if it is integrated into the form of teaching materials to provide output in the form of authentic learning-based teaching materials.

Students' engagement in problem-solving activities is prioritized throughout the learning process. In fact, since childhood, people, including students, have actively solved problems presented by the real world (Chusinkunawut et al., 2018). Further, inquiry-based

curricula and teaching practices help enhance students' problem-solving and application of knowledge in dealing with real-world problems. As a result, students should become accustomed to collaborating with their classmates to boost their collaborative involvement. Tan et al. (2016) in their study reported that students found problem-solving is a skill that requires teamwork, research, and communication that are effectively used. The main solution to support a collaborative learning environment is to use a collaborative problem-solving model. Collaborative problem solving is a process in which two or more individuals collaborate to share knowledge and discover answers to issues (Davier et al., 2017). Collaborative problem-solving skills improve in quality as they build on domain-specific learning experiences (Kano et al., 2022). Its syntax includes engagement, exploration, transformation, solution, presentation, and reflection (Fathani, 2018). In this model, collaboration is cooperation in which each group member contributes in a balanced manner to achieve the intended goals (Hikmah et al., 2020).

The presence of authentic learning is one of the aspects that foster cooperation in the classroom (Aisyah et al., 2022). Corollary, the collaborative problem-solving learning approach, is used in cooperation with authentic learning utilizing linear motion teaching materials. This combination improves students' comprehension and capacity to work together to solve challenges. It is accomplished by integrating real-world phenomena in the prepared teaching materials and the problem-solving approach in the example questions. Thus, learning objectives can be directed by these teaching materials, and students can collaborate to solve problems.

Authentic learning-based teaching materials using a collaborative problem-solving model will help students comprehend the materials and collaboratively solve the issues related to linear motion. The results of this development are expected to be a quality reference for schools to overcome the limits of authentic learning-based teaching materials. The development of authentic learning-based teaching materials is also supported by the research results of Ridho et al. (2020). In addition, relevant research from Setiaji (2016) shows that the collaborative problem-solving model positively influences students' ability to understand a concept. According to Nieveen et al. (2013), the success of a product made can only be achieved if its content and construction follow its development goals. It relates to one aspect of feasibility which is called validity. Authentic learning-based physics teaching materials are categorized as valid and reliable to be suitable for use in the learning process.

Teachers must take extra care when selecting or building assessment tools to match specific learning objectives (Nasution et al., 2021). In essence, the teaching materials developed must be tested for feasibility to produce a quality product. One of the feasibility tests of developing teaching materials can be done by knowing their validity. It is significant because validity refers to the quality of instructional materials as determined by the learning objectives to be met. Students should utilize valid educational materials as guidance and learning resources. Therefore, this study aims to describe the validity of linear motion teaching materials based on authentic learning using a collaborative problem-solving model.

Method

Type of Study

The type of this study is Research and Development using the ASSURE model. This development model was chosen because the components of this development model are complete and practical to implement in the study. However, this paper goes through the first four stages of ASSURE: analyzing students' characteristics, stating the objectives, selecting media and materials, and utilizing media and materials. Figure 1 shows the strategy for each level in detail.

Figure 1. The first four of ASSURE development model stage

Validity Test

The development stages are implemented systematically using a collaborative problem-solving model to provide authentic learning-based straight motion teaching materials. Aspects of format, language, content, presentation, and benefits/usability of teaching materials are all examined as part of the validity of the teaching materials (Pratama et al., 2019). Three professional validators validated the product using a teaching material validation sheet. The average score for each aspect of the assessment was generated using the

validation findings, and the scores were subsequently compared to the validity criteria outlined by Widoyoko (2017), as shown in Table 1.

Table 3. Criteria of the Teaching Materials' Validity

Average score	Criteria
$\bar{x} > 3.4$	Very Valid
$2.8 < \bar{x} \leq 3.4$	Valid
$2.2 < \bar{x} \leq 2.8$	Valid enough/ fair
$1.6 < \bar{x} \leq 2.2$	Less Valid
$\bar{x} \leq 1.6$	Not Valid

The theoretical validity of the instructional materials was examined in the study. This validity is based on an expert perspective or judgment, scrutinized in content and constructions (Hidayati et al., 2016). According to Yusup (2018), content validity is related to the suitability of a product's content and the theory that underpins it, whereas construct validity is engaged with the quality of the components and elements that build the product being developed. The results of the validation of the experts also calculated the reliability with the Cronbach's Alpha equation.

Result and Discussion

The development carried out in this study resulted in authentic learning-based linear motion teaching materials that could be applied using a collaborative problem-solving model. This teaching material is available as an electronic flipbook generated with the Flip PDF Corporate Edition application and can be accessed via the link provided by 000webhost. Additionally, various illustrations of linear motion are projected using the Microsoft PowerPoint tool to exhibit clear, appealing, and easy visuals.

The discussion in this teaching material includes many notions of linear motion associated with real-life occurrences and encourages students to engage in problem-solving using examples of questions. The teaching materials include cover, introduction, table of contents, instructions for use, concept maps, basic competencies, indicators, learning objectives, materials, pictures, info-info, sample questions, summaries, competency tests, answer keys, and bibliography. The results of this product development are then validated by two academic validators and one practitioner validator to know their validity.

Validity is a measure of a product's validity derived through a series of examinations before learning (Alfianika, 2018). The assessment results in the score column of the validation sheet, which has a scale range of 1-4, show the validity of the prepared teaching materials. Table 2 shows the results of the validation of teaching materials for each aspect.

The findings of the overall validity assessment of the teaching materials yield an average overall score of 3.55, with a very valid category. The development product that has been deemed valid means that its components have fulfilled the content and built standards of a quality product (Nieveen et al., 2013). Furthermore, the findings of validators' assessments tend to be constant in every way, resulting in extremely good reliability calculations, with a score of 0.97. If a product's assessment yields consistent results, the assessment's findings do reflect the product's quality (Yudha et al., 2014). Thus, the generated teaching materials are ready to be used in the classroom.

Table 4. Assessment of the Validity of Teaching Materials

Assessment Aspects	Average	Category
Format of the teaching materials	3.52	Very Valid
Language	3.49	Very Valid
Content of the teaching materials	3.58	Very Valid
Presentation	3.51	Very Valid
Advantages of the teaching materials	3.67	Very Valid
Validity of the teaching materials	3.55	Very Valid
Reliability	0.97	Very High

The quality of teaching materials can be explained in more detail through each aspect that builds its validity. The findings were obtained with a highly valid category in terms of the format of the teaching materials. The existence of learning objectives, a clear numbering system, the appropriate letter format, the suitability of the material summary, the text and illustrations can be seen clearly, and the fulfillment of the main components that make up the learning materials all show that the teaching materials are very well constructed. As seen in Figure 2, the cover design symbolizes the phenomena of linear motion in everyday life. The visuals offered are real-life representations that help students visualize events and issues in a straight line. Flip PDF Corporate Edition as a material design program likewise supports format setting so that the appearance and layout of the elements in the instructional materials are appropriate and appealing. According to Ridho et al. (2020), a proper format's carrying capacity can foster students' interest in the teaching materials generated, allowing them to regulate their attention to the learning process better. Furthermore, the various color patterns make using these instructional materials more enticing to students (Rianti et al., 2021).

The language aspect of the validity of the teaching materials is assessed as very valid. Since it is in line with students' progress, both in terms of the degree of thinking development and social-emotional development, the presentation of the content in it may

be transmitted effectively. This progress is linked to their ability to comprehend concepts and apply reasoning to draw logical inferences from the learned content (Azizah et al., 2021). The choice of appropriate language for their development stage will help build critical thinking patterns and problem-solving reasoning skills (Ridho et al., 2020). The vocabulary used is not rigid, and it is conveyed dialogically through apperception, which can excite and urge people to think.

Figure 2. Cover of the linear motion teaching materials

Nonetheless, the term's standard is still applied in these teaching materials, ensuring that the language is straightforward, follows spelling, and has no multiple meanings. To avoid students' misinterpretations of physics topics, the use of terminology and symbols is also consistent. These criteria also matched the Ministry of National Education's (Depdiknas, 2008) linguistic requirements, including meaning integrity, conformity to Indonesian language norms, grammar, and easily understandable messaging.

Complete sentence construction in language must be supported by quality content from this linear motion teaching material. On the content side, the validity of the teaching materials is rated as very valid. It can be proven from symbols, terms, units, facts, and concepts that accurately describe the basic competencies of linear motion. The scope of the material is supported by a complete and in-depth discussion so that students can adjust the knowledge they have gained with the development of science. Students benefit from the extensive content of teaching materials as they progress through the learning process (Yuberti, 2014). In addition, examples of phenomena in the form of genuine learning are offered that are relevant to students' situations and backed up by current sources that align with today's learning needs.

Figure 3. Authentic learning on the teaching materials

The next aspect relates to the presentation of content as the main aspect in showing the integrity of its content. The validity of teaching materials on the presentation aspect is categorized as very valid. The criteria are classified based on the presentation technique, presentation support, and learning presentation in the material. In the presentation technique, each chapter and sub-chapter is composed of consistent and balanced material from easy to complex subjects so that the concept of linear motion can be studied coherently. Authentic learning is also presented to connect abstract concepts in linear motion with real facts in the lives of students, such as the movement of land transportation, *kelotok* or boats crossing rivers and lakes in a tourist attraction, fruit falling freely from the tree trunk, and ball motion in games of *bekel* ball. Authentic learning makes the information presented by teaching materials more meaningful (Kamalia et al., 2022). Physics learning will be more meaningful if learning facilities and references are taken from daily activities around the students' living environment (Oktaviana et al., 2017). In addition, authentic learning is able to reflect the problems around students to be more relevant to physics concepts (Arsyad et al., 2020).

In order to condense information efficiently, certain summaries in the teaching materials include tables and figures. Moreover, each chapter includes examples of real questions and debates to help students practice their collaborative problem-solving abilities. Students'

problem-solving abilities will improve if they are trained regularly at each meeting (Habibi et al., 2017).

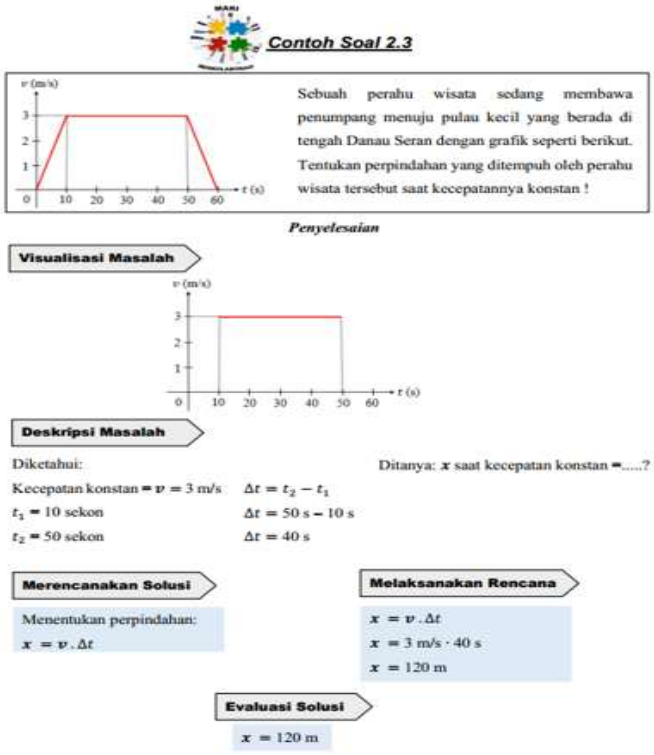

Figure 4. Examples of questions on teaching materials

Discussion

The competence test section also aids in developing problem-solving skills and is accompanied by an answer key attachment. This linear motion teaching materials may be used in the learning process with a collaborative problem-solving approach, especially during the transformation phase. Through the "Let's Collaborate" section on real instances of questions that allow interactive dialogue to be developed, students become part of group discussions to solve problems based on the subjects learned in the teaching materials. the collaborative problem solving was controllable and standardized, which can place students in a variety of different collaborative situations, as well as control test time (Tang et al., 2021). As a result, students will better understand their group position while working to solve problems based on the phases described in the instructional materials.

Starting with envisioning the problem and ending with assessing the solution, the examples of questions in the training materials depict the stages of problem-solving using the indicators proposed by Heller et al. (1992). As a result, problem-solving is practiced by using examples of questions from the training materials. It is corroborated by the findings of Kharisma et al. (2018) study, which found that the example questions provided in instructional materials can help students improve their problem-solving skills. Furthermore, these teaching materials include intriguing elements such as the "Let's Know" section, which offers material details, the "At a Glance Information" section, which contains valuable information to extend the gems of knowledge, and the "Magic Symbol" section, which contains a link to encourage students' interest Students' curiosity should be piqued by presenting them with engaging educational resources (Sriwahyuni et al., 2019).

Based on benefit, the validity of the teaching materials is rated as very valid. The teaching resources developed can help teachers authentically teach the notion of linear motion, especially when employing a collaborative problem-solving model. Also, this authentic learning-based linear motion teaching material can be utilized as a resource for students to study independently and discuss in groups to comprehend the contents fully. As a result, these teaching materials promote learner-centered learning while reducing reliance on teachers (Yasini, 2019).

Assessment is an integral part of academic life and an effective way of receiving feedback on students learning outcomes. The results obtained from the assessment in each aspect of its validity determine the quality of the teaching materials developed. According to (Shortt et al., 2021)., validity is one of the eligibility criteria for product development. According to experts, the teaching materials developed in this study have been categorized as very valid. A product with high validity indicates that it can carry out its functions properly or provide results in accordance with its development objectives (Alfianika, 2018). Validity is also one of the references that a teaching material can be used in the learning process (Aini et al., 2018). Therefore, these teaching materials can be tested on students through classroom learning.

Conclusion

Based on the data and development results discussed, it is concluded that authentic learning based on linear motion teaching materials using the collaborative problem-solving model is categorized as very valid. Thus, the developed teaching materials can be tried out in classroom learning and used as a learning resource for students to solve problems collaboratively. The results of this study are expected to provide future benefits as follows: For students, this research is expected to provide alternative learning materials that can help them understand the material and train the ability to collaborate in solving problems. For teachers, this research is expected to provide a reference for using authentic learning-based teaching materials through collaborative problem-solving models in the learning

process. For schools, research results can be used as input in efforts to improve the quality of education. (4) For researchers, research results can be used as a reference in making authentic learning-based teaching materials using a collaborative problem-solving model.

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Author Contributions
Nadrah: writing original draft preparation introduction, result, discussion, methodology, and then conclusion. She also had ideas for the research process, data processing, converting to English, reviewing, editing.

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The authors declare that there is no conflict of interest regarding the publication of this paper.

References

Aini, N., Zainuddin, Z., & Mahardika, A. I. (2018). Pengembangan Materi Ajar IPA Menggunakan Model Pembelajaran Kooperatif Berorientasi Lingkungan Lahan Basah. *Berkala Ilmiah Pendidikan Fisika*, *6*(2), 264–277. Retrieved from https://ppjp.ulm.ac.id/journal/index.php/bipf/article/view/4919/pdf

Aisyah, S., Sari, D. I., & Faulina, R. (2022). The Effectiveness of Probing-Prompting Learning Model using Google Meet Platform on Student's Mathematical Communication Ability. *Journal of Medives: Journal of Mathematics Education IKIP Veteran Semarang*, *6*(1), 211. https://doi.org/10.31331/medivesveteran.v6i1.1940

Alfayez, M. Q. E., Aladwan, S. Q. A., & Shaheen, H. R. A. (2022). The Effect of a Training Program Based on Mathematical Problem-Solving Strategies on Critical Thinking Among Seventh-Grade Students. *Frontiers in Education*, *7*(April), 1–9. https://doi.org/10.3389/feduc.2022.870524

Alfianika, N. (2018). *Buku Ajar Metode Penelitian Pengajaran Bahasa Indonesia*. CV Budi Utama.

Aritonang, I. R., Lasmana, S., & Kurnia, D. (2019). The Analysis of Skimming And Scanning Technique To Improve Students In Teaching Reading Comprehension. *PROJECT (Professional Journal of English Education)*, *1*(2), 101. https://doi.org/10.22460/project.v1i2.p101-106

Arsyad, Z., Wati, M., & Suyidno, S. (2020). The Effectiveness of the Module Static Fluid with Authentic Learning to Train Students' Problem-Solving Skills. *SEJ (Science Education Journal)*, *4*(2), 113–128. Retrieved from https://sej.umsida.ac.id/index.php/sej/article/view/1017

Azizah, A., & Fajeriah, S. (2021). The Effect of Offline Learning Model Assisted in Practicum Discovery Learning on Learning Outcomes. *Nazhruna: Jurnal Pendidikan Islam*, *4*(3), 663–671. https://doi.org/10.31538/nzh.v4i3.1667

Bagassi, M., & Macchi, L. (2020). Creative Problem Solving as Overcoming a Misunderstanding. *Frontiers in Education*, *5*(December), 1–10. https://doi.org/10.3389/feduc.2020.538202

Bogaerds-Hazenberg, S. T. M., Evers-Vermeul, J., & Bergh, H. (2021). A Meta-Analysis on the Effects of Text Structure Instruction on Reading Comprehension in the Upper Elementary Grades. *Reading Research Quarterly*, *56*(3), 435–462. https://doi.org/10.1002/rrq.311

Chiu, B., Randles, C., & Irby, S. (2022). Analyzing Student Problem-Solving With MAtCH. *Frontiers in Education*, *6*(January), 1–14. https://doi.org/10.3389/feduc.2021.769042

Chusinkunawut, K., Nugultham, K., Wannagatesiri, T., & Fakcharoenphol, W. (2018). Problem solving ability assessment based on design for secondary school students. *International Journal of Innovation in Science and Mathematics Education*, *26*(3), 1–20. Retrieved from https://openjournals.library.sydney.edu.au/CAL/article/view/12413

Davier, M. Von, He, Q., Samuel, G., Steinhauer, E. W., & Borysewicz, P. B. (2017). Collaborative Problem Solving Measures in the Programme for International Student Assessment (PISA). *Innovative Assessment of Collaboration*, 95–111. Retrieved from https://psycnet.apa.org/doi/10.1007/978-3-319-33261-1_7

Dhillon, B. P. S., Herman, H., & Syafryadin, S. (2020). The Effect of Skimming Method to Improve Students' Ability in Reading Comprehension on Narrative Text. *Linguists: Journal Of Linguistics and Language Teaching*, *6*(1), 77. https://doi.org/10.29300/ling.v6i1.2991

Fathani, A. H. (2018). Sintaks Model Pembelajaran Matematika Collaborative Problem Solving Pada Materi Sistem Persamaan Linear Tiga Variabel (SPLTV). *Buana Matematika: Jurnal Ilmiah Matematika Dan Pendidikan Matematika*, *8*(2), 65–72. https://doi.org/10.36456/buanamatematika.v8i2:.1730

Habibi, M., Zainuddin, Z., & Misbah, M. (2017). Pengembangan Perangkat Pembelajaran IPA Fisika Berorientasi Kemampuan Pemecahan Masalah Menggunakan Model Pengajaran Langsung Pada Pokok Bahasan Tekanan Di SMP Negeri 11 Banjarmasin. *Berkala Ilmiah Pendidikan Fisika*, *5*(1), 1. https://doi.org/10.20527/bipf.v5i1.2234

Heller, P., Keith, R., & Anderson, S. (1992). Teaching Problem Solving Through Cooperative Grouping. Part 1: Group Versus Individual Problem Solving. *American Journal of Physics*, *60*(7), 627–636. https://doi.org/10.1119/1.17117

Hidayati, S. N., Sabtiawan, W. B., & Subekti, H. (2016). Pengembangan Instrumen Penilaian Otentik : Validitas Teoritis dan Kepraktisan. *Jurnal Penelitian Pendidikan IPA*, *1*(1), 22–26. https://doi.org/10.26740/jppipa.v1n1.p22-26

Hikmah, N. H., & Siswono, T. Y. E. (2020). Profil Collaborative Problem Solving Siswa Kelas IX dalam Memecahkan Masalah Aljabar. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, *04*(02), 701–710. https://doi.org/10.31004/cendekia.v4i2.262

Kamalia, P. U., Sakti, N. C., & Kurniawan, R. Y. (2022). Comparative Study of Student Learning Outcomes in Online and Offline Learning during the Pandemic. *IJORER : International Journal of Recent Educational Research*, *3*(6), 662–671. https://doi.org/10.46245/ijorer.v3i6.256

Kano, T., Yokoyama, K., & Yamamoto, Y. (2022). The Influence of Shared Intentions With Others in Physical and Cognitive Tasks That Require Collaborative Solving in Elementary School. *Frontiers in Education*, *7*(June), 1–13. https://doi.org/10.3389/feduc.2022.863267

Kharisma, J. Y., & Asman, A. (2018). Pengembangan Bahan Ajar Matematika Berbasis Masalah Berorientasi pada Kemampuan Pemecahan Masalah Matematis dan Prestasi Belajar Matematika. *Indonesian Journal of Mathematics Education*, *1*(1), 34–46. http://dx.doi.org/10.21831/jpms.v5i2.16690

Lombardi, M. M. (2007). Authentic Learning for the 21st Century: An Overview. *Educause Learning Initiative*, *1*, 1–12. Retrieved from https://alicechristie.org/classes/530/EduCause.pdf

Maharani, N., Hadiyan, A., & Murdiyanto, T. (2021). Pengaruh Model Pembelajaran Creative Problem Solving (CPS) dalam Pembelajaran Jarak Jauh (PJJ) terhadap Kemampuan Berpikir Kritis Matematis Siswa. *Jurnal Riset Pendidikan Matematika Jakarta*, *3*(1), 48–57. https://doi.org/10.21009/jrpmj.v3i1.20110

Nasution, A. I., Rohani, & Tristiana, D. W. (2021). Modification Of The Model Problem Solving Learning With The Approach Of Offline in Class X Private SMK az zahra sonomartani. *International Journal Of Humanities Education and Social Sciences (IJHESS)*, *1*(2). https://doi.org/10.55227/ijhess.v1i2.40

Nieveen, N., & Folmer, E. (2013). Formative evaluation in educational design research. *Educational Design Research. Part A: An Introduction*, *153*, 152–169. Retrieved from https://s2pnd-matematika.fkip.unpatti.ac.id/wp-content/uploads/2022/10/educational-design-research-part-a.pdf#page=154

Okkinga, M., van Steensel, R., van Gelderen, A. J. S., & Sleegers, P. J. C. (2018). Effects of reciprocal teaching on reading comprehension of low-achieving adolescents. The importance of specific teacher skills. *Journal of Research in Reading*, *41*(1), 20–41. https://doi.org/10.1111/1467-9817.12082

Oktaviana, D., Hartini, S., & Misbah, M. (2017). Pengembangan Modul Fisika Berintegrasi Kearifan Lokal Membuat Minyak Lala Untuk Melatih Karakter Sanggam. *Berkala Ilmiah Pendidikan Fisika*, *5*(3), 272–285. https://doi.org/10.20527/bipf.v5i3.3894

Pratama, H., & Prastyaningrum, I. (2019). Effectiveness of the use of Integrated Project Based Learning model, Telegram messenger, and plagiarism checker on learning outcomes. *Journal of Physics: Conference Series*, *1171*(1), 012033. https://doi.org/10.1088/1742-6596/1171/1/012033

Pratiwi, W. A. (2016). Pengembangan LKPD IPA dengan Pendekatan Authentic Inquiry Learning pada Sub Materi Fotosintesis untuk Meningkatkan Kemampuan Problem Solving dan Sikap Ingin Tahu Peserta Didik Kelas VII SMP. *Pend. Ilmu Pengetahuan Alam-S1*, *5*(4). Retrieved from https://journal.student.uny.ac.id/index.php/ipa/article/view/1093

Primadiati, I. D., & Djukri, D. (2017). Pengaruh model collaborative learning terhadap peningkatan motivasi dan hasil belajar IPA siswa kelas IV SD. *Jurnal Prima Edukasia*, *5*(1), 47–57. Retrieved from https://journal.uny.ac.id/index.php/jpe/article/viewFile/7712/pdf

Rahmat, E. P. (2019). *Penerapan Model Pembelajaran Collaborative Problem Solving untuk Meningkatkan Representasi Matematis dan Motivasi Belajar Siswa: Penelitian Quasi Eksperimen di Kelas VIII SMP Negeri 56 Bandung*. UIN Sunan Gunung Djati Bandung.

Rianti, N. A., Wati, M., Suyidno, S., & Sasmita, F. D. (2021). Pengembangan Bahan Ajar dengan Model Inkuiri Terbimbing untuk Melatih Kemampuan

Berpikir Kritis Peserta Didik. *Jurnal Ilmiah Pendidikan Fisika*, *5*(2), 94–106. https://doi.org/10.20527/jipf.v5i2.2956

Ridho, M. H., Wati, M., Misbah, M., & Mahtari, S. (2020). Validitas Bahan Ajar Gerak Melingkar Berbasis Authentic Learning Di Lingkungan Lahan Basah Untuk Melatih Keterampilan Pemecahan Masalah. *Journal of Teaching and Learning Physics*, *5*(2), 87–98. https://doi.org/10.15575/jotalp.v5i2.8453

Rodríguez-Antón, J. M., & Alonso-Almeida, M. del M. (2020). COVID-19 Impacts and Recovery Strategies: The Case of the Hospitality Industry in Spain. *Sustainability*, *12*(20), 8599. https://doi.org/10.3390/su12208599

Sebayang, W. A. B., Laia, A., & Nababan, R. (2022). Pengaruh Model Pembelajaran Creative Problem Solving Terhadap Hasil Belajar PKN pada Materi Kesejarahan Perumusan UUD 1945 Kelas VII SMP 2 Tiga Binanga Tahun Ajaran 2021/2022. *Jurnal Pendidikan Pancasila dan Kewarganegaraan*, *4*(1), 49–60. Retrieved from https://jurnal.darmaagung.ac.id/index.php/civiceducation/article/download/1551/1382

Septarianto, M. F., Astutik, S., Kurnianto, F. A., Kantun, S., & Pangastuti, E. I. (2022). Pengaruh Model Pembelajaran Collaborrative Creativity (CC) Berbasis Daring & Luring Terhadap Kemampuan Kolaboratif Ilmiah dan Hasil Belajar Geografi Siswa. *Majalah Pembelajaran Geografi*, *5*(2), 69–81. Retrieved from https://jurnal.unej.ac.id/index.php/PGEO/article/view/33138

Shortt, M., Tilak, S., Kuznetcova, I., Martens, B., & Akinkuolie, B. (2021). Gamification in mobile-assisted language learning: A systematic review of Duolingo literature from public release of 2012 to early 2020. *Computer Assisted Language Learning*, 1–38. https://doi.org/10.1080/09588221.2021.1933540

Sriwahyuni, I., Risdianto, E., & Johan, H. (2019). Pengembangan Bahan Ajar Elektronik Menggunakan Flip Pdf Professional pada Materi Alat-Alat Optik Di SMA. *Jurnal Kumparan Fisika*, *2*(3), 145–152. https://doi.org/10.33369/jkf.2.3.145-152

Sulistiani, D. (2018). Penerapan Metode Outentic Learning Dapat Meningkatkan Pembelajaran Ilmu Pengetahuan Alam. *JPG: Jurnal Penelitian Guru FKIP Universitas Subang*, *1*(2), 23–32. Retrieved from https://www.ejournal.unsub.ac.id/index.php/JPG/article/view/352

Tan, D. K. Y., Koppi, A., & Field, D. J. (2016). First year agricultural science student perspectives in graduate attribute development through problem-based learning. *International Journal of Innovation in Science and Mathematics Education*, *24*(1), 54–66. Retrieved from https://openjournals.library.sydney.edu.au/CAL/article/view/8481

Tang, P., Liu, H., & Wen, H. (2021). Factors Predicting Collaborative Problem Solving: Based on the Data From PISA 2015. *Frontiers in Education*, *6*(September 2016), 1–10. https://doi.org/10.3389/feduc.2021.619450

Vera, A. F. (2021). *Pengaruh Model Pembelajaran Creative Problem Solving (CPS) Berbantuan Bridging Analogy Terhadap Kemampuan Pemecahan Masalah Matematis Ditinjau dari Gaya Belajar Peserta Didik*. UIN Raden Intan Lampung.

Yasini, A. B. (2019). *Penggunaan Authentic Materials dan Created Materials Berbasis Cooperative Script dalam Kemampuan Membaca*. Universitas Negeri Yogyakarta.

Yuberti, Y. (2014). *Teori Pembelajaran dan Pengembangan Bahan Ajar dalam Pendidikan*. Anugrah Utama Raharja (AURA).

Yudha, R. P., Masrukan, M., & Djuniadi, D. (2014). Pengembangan Instrumen Asesmen Otentik Unjuk Kerja Materi Bangun Ruang di Sekolah Dasar. *Journal of Educational Research and Evaluation*, *3*(2), 62–67. Retrieved from https://journal.unnes.ac.id/sju/index.php/jere/article/view/4397

Yusup, F. (2018). Uji validitas dan reliabilitas instrumen penelitian kuantitatif. *Tarbiyah: Jurnal Ilmiah Kependidikan*, *7*(1). https://doi.org/10.18592/tarbiyah.v7i1.2100