Microlearning Based on Creative Problem Solving: A Solution to improve Numeracy Literacy Skills of Grade 4 Elementary Students

Rosiana Mufliva1, Nursyifa2, Wafiq Nur Fauziah3, Astri4, Anisya Pramitha Rahayu5, Rezqi Dwi Chairunnisa Febrianti6, Mutiara Qalby Chairunisa7

[1]Elementary Education Study Program, Universitas Pendidikan Indonesia, Bandung, Indonesia

[2,3,4,5,6,7]Elementary School Teacher Education Study Program, Universitas Pendidikan Indonesia, Bandung, Indonesia

rosianamufliva@upi.edu

Abstract. This study was motivated by the misconceptions experienced by elementary school students in learning mathematics about money and its conversion due to the not optimal use of mathematics textbooks and the unavailability of varied learning resources that can facilitate each student's different learning styles and in accordance with developmental tasks and student needs, thus having an impact on the low numeracy literacy skills of students. The purpose of this research is to develop microlearning based on Creative Problem Solving (CPS) on the material of money and its conversion in grade 4 elementary school, obtain an overview of the feasibility of microlearning based on CPS, and obtain an overview of the improvement of students' numeracy literacy skills. In this study, data collection was carried out using the test method in the form of giving pre-test and post-test and tested quantitatively through the n-gain test to determine the improvement of students' numeracy literacy skills and non-test methods in the form of questionnaires that were analyzed qualitatively. This research uses the ADDIE model which has five stages, namely Analyze, Design, Development, Implementation, Evaluation. The results of the research obtained are the development of CPS-based microlearning using the ADDIE model, the results of the feasibility test of teaching materials based on the results of the subject matter expert review of 96% with very good qualifications, the results of the learning design expert review of 95% with very good qualifications, the results of the learning practitioner review of 92% with very good qualifications, the response of students of 95% with very good qualifications. The increase in mathematical literacy skills was also shown by students with an n-gain score of 0.56 in the medium category. This research shows that CPS-based microlearning on money and its conversion material is feasible to use and can improve students' mathematical literacy skills. The conclusion of this research is that this CPS-based microlearning can be used to help grade IV elementary school students construct students' mathematical literacy skills about money and its conversion.

Keywords: Microlearning, Creative Problem Solving, Numeracy Literacy.

How to Cite: Mufliva, R., et al. (2025). Microlearning Based on Creative Problem Solving: A Solution to improve Numeracy Literacy Skills of Grade 4 Elementary Students. The 7th International Conference on Elementary Education. 7(1). 630 – 644.

INTRODUCTION

The numeracy literacy skills of students in Indonesia, especially at the phase B primary school level, are a major focus of efforts to improve the quality of education. Numeracy literacy is not only related to the basic ability to count, but also includes students' ability to apply mathematical concepts in everyday contexts and solve complex problems (OECD, 2016). This is in line with the view of (Hasanah, 2016) that mathematical literacy plays an important role in helping students to find solutions to mathematical problems applied in everyday life. In line with this opinion, de Lange (2003: 76) Mathematical literacy refers to a person's ability to formulate, apply, and interpret mathematics in various situations, including thinking mathematically and using mathematical concepts, procedures, facts, and tools to explain and predict events. Thus, mathematical literacy can be defined as the ability where a person not only understands mathematical concepts, understands problem-solving procedures, and

knows mathematical facts and tools, but is also able to utilise this knowledge to consider various possibilities and apply them in modern life that is constantly changing.

A learning orientation that emphasises numeracy literacy is important to prepare students for the challenges in modern life that are increasingly oriented towards problem solving. One innovative approach that can be used to improve numeracy literacy is microlearning, which refers to learning in small, focused units. Microlearning in learning can be interpreted as learning that is carried out in a short time, low learning content, and student independence in the learning process (Permana, 2020; Mohammed et al., 2018). Microlearning allows students to learn in a more flexible way, making lessons easier to understand and apply (Hug, 2005). In line with the views of (Mohammed, Wakil, & Nawroly, 2018). Microlearning can facilitate understanding of learning content and improve long-term memory. In addition, this approach can also improve effectiveness and efficiency in the learning process. This method is particularly relevant to the characteristics of primary school students who often have limited attention spans. By dividing the material into small parts, students can learn gradually and independently, which can increase motivation and learning retention.

In addition, the CPS approach can assist microlearning-based learning in various ways. According to E. Lumsdaine and M. Lumsdaine (1995), the application of CPS might encourage iterative and collaborative thinking, i.e. a problem-solving process that is carried out repeatedly. Students may be motivated to extend and refine their ideas. In other words, microlearning-based learning, which divides the material into small parts, has similarities with creative problem solving. So, the development of concepts and the application of problem solutions will proceed gradually. Moreover, in the creative problem solving process, team members work together to define the problem, create new ideas, and evaluate solutions. This process encourages the exchange of different ideas and perspectives, which can enhance the problem-solving process and result in more effective, innovative and creative solutions. This is confirmed by Helen & Kusdiwelirawan (2022) who stated that the CPS learning model is a learning model that can train students' creative thinking skills. Becausethis learning model allows students to use their thinking skills to solve problems after thinking carefully, considering different points of view, and producing the best solution. In mathematics, a creative and critical mindset is an ability that can find and solve mathematical problems (Moma, 2016). This discovery or solving of different methods that CPS has encourages student creativity (Husnawati et al., 2015; Ginting et al., 2019). This approach encourages students to be actively involved in the learning process, as well as improving their self-confidence and critical thinking skills.

However, while both approaches offer great potential, challenges in their implementation in the classroom often arise, such as teachers‘ lack of understanding of these methods and the need for customisation of materials to suit students’ characteristics. Therefore, the development of microlearning based on creative problem solving is an important step to create an effective and enjoyable learning experience (Koper, 2010). Microlearning is a small-scale learning method that divides content (learning objects) into small segments with various media formats. This results in ‘short content’, which allows a person to quickly understand the content and allows learning anywhere and anytime by using technology, information, and communication (Susilana et al., 2020). According to (Ulupui, et al. 2021) microlearning presents learning materials in small chunks that are easier to understand, and provides the flexibility to access them anytime, anywhere, and in a format that suits your needs. Through this research, it is expected that the development of microlearning based on creative problem solving can improve the numeracy literacy skills of phase B elementary school students. With an innovative and collaborative approach, students are expected to not only be able to understand mathematical concepts, but also be actively involved in a meaningful learning process.

THEORETICAL FRAMEWORK

Microlearning is a teaching method that delivers content in small, focused segments, making it easier for learners to absorb and retain information. Research highlights the effectiveness of microlearning in fostering active engagement and improving learning outcomes by breaking down complex topics into manageable units (Hug, 2007). For elementary school students, especially in numerical literacy, this approach aligns with their developmental capacity to process information in short bursts. Numerical literacy refers to the ability to understand and use numerical data in real-life contexts, including financial literacy and currency conversion. According to Ginsburg (2006), fostering numerical literacy at an early age equips students with critical life skills that enable them to navigate everyday transactions and financial decision-making effectively. For elementary students, this foundational skill is essential to build their understanding of numbers and arithmetic operations. Microlearning offers an adaptive platform for teaching numerical literacy. By providing short, interactive lessons, microlearning caters to diverse learning paces and styles, thus ensuring that all students can grasp foundational concepts like money management and currency conversion. Clark and Mayer (2016) emphasize that microlearning’s focus on core concepts helps reduce cognitive overload, thereby enhancing retention and application.

Teaching topics such as money and conversion through microlearning involves using visual aids, gamified activities, and real-world scenarios to make learning more relatable and practical. For instance, interactive digital tools that simulate transactions can help students

practice conversions in engaging ways. Research by Mayer (2005) underscores the value of multimedia learning in making abstract concepts tangible, a principle that is central to microlearning design. Studies have shown that microlearning significantly improves students' understanding of specific topics due to its focused and iterative approach (Buchem & Hamelmann, 2010). In the context of elementary education, microlearning has been found to boost motivation, enhance problem-solving skills, and support the development of financial literacy. The integration of microlearning into elementary education offers a promising strategy for enhancing numerical literacy, particularly regarding money and its conversion. By leveraging concise, interactive lessons, educators can create an engaging and effective learning environment that supports students' long-term academic and practical competencies.

METHODOLOGY

This research uses the Design and Development (D&D) method. According to Richey R. and Klein (2007), the purpose of the design and development (D&D) method is to create products, instructional and non-instructional tools both new models and improvements to their development. The selection of this method is in accordance with this objective. The development model used in this study uses the ADDIE model (analysis, design, development, implementation and evaluation) (Spatioti, 2022, p. 2) which focuses on media design and development. The ADDIE model can be seen visually in the following figure:

Figure 1. Stages of the ADDIE Method

Source: Cahyadi (2019)

At the analysis stage, the researcher identified the problem by reviewing the literature and conducting a preliminary study to the elementary school by observing the mathematics learning process. After confirming the problem, the researcher conducted planning (design), at this stage the researcher designed ideas about the solution to the problem and decided on a relevant prototype based on various references. Next, at the development stage, the researcher compiled the previously designed prototype into a product according to the previous decision by paying attention to various aspects such as the needs of students and the ease of use by users. After the product has been developed, the researcher continues at the implementation stage, at this stage the product is validated by experts ranging from material experts, design, learning practitioners and students. The instrument used in this

research is a questionnaire addressed to material experts, media experts, learning practitioners (teachers), and elementary school students.

The material expert questionnaire includes aspects of independent and stand-alone learning (Mufliva, 2022; Hafidzah, 2021). The media expert questionnaire includes aspects of media display, image composition, text composition, ease of use, and adaptability (Giwangsa, 2021; Hajidi, 2019; Mufliva, 2022). Practitioner questionnaires include aspects of media, material, language and support (Indriyanti, 2017, Sari 2019, Hafidzah, 2021). Meanwhile, the student response questionnaire includes aspects of convenience, motivation and attractiveness (Hajidi, 2019). The limited trial of this research was conducted on 5 grade 4 students of one of the elementary schools in Bandung City to observe the research subject's response to the interactive digital book developed by the researcher. Finally, after the developed product received feedback and reviews from experts and students, researchers entered the evaluation stage, at this stage the product was improved according to the input and then applied to students to obtain an overview of the improvement of students' concept understanding abilities. The instruments used at this stage are pre-test and post-test sheets related to data presentation material. In addition, an observation sheet was also used to see students' productive fighting power.The criteria for evaluating the presentation results of the research instrument in the form of a questionnaire are arranged based on a Likert scale (Widarta, 2020) as follows:

Table 1. Learner Worksheet Feasibility Criteria and Percentage Range

Score in Percent (%)	Categories
>80-100	Very Good
>60-80	Good
>40-60	Enough
>20-40	Lacking
0-20	Very Lacking

In addition to looking at the feasibility of teaching materials, the increase in students' mathematical concept understanding ability as seen from the results of the pre-test and post-test was also calculated using the N-gain calculation. The formula used to find the N-gain value and the N-gain criteria table according to Hake in (Kurniawan & Hidayah, 2021) is as follows:

$$N - gain\ (g) = \frac{skor\ posttest - skor\ pretest}{skor\ maksimal - skor\ pretest}$$

After obtaining the results of the N-gain calculation, the interpreted improvement criteria from the gain normality value according to Hake are in table 2.

Table 2. N-Gain Criteria

No	N-Gain Score	Criteria
1	0,70 ≤ n ≤ 1,00	High
2	0,30 ≤ n ≤ 0,70	Medium
3	0,00 ≤ n ≤ 0,30	Low

RESULTS AND DISCUSSION

Microlearning based on Creative Problem Solving on money material in elementary school was designed by previously conducting observations and preliminary studies to find out the learning difficulties experienced by students in number subjects. This activity was carried out on third grade students at an elementary school in Bandung City, which was then followed by in-depth interviews. The results revealed that most students had difficulty in learning about money, especially when converting money values. This was due to the students' low motivation to learn during mathematics learning and the absence of a variety of learning resources for students when learning about money and its conversion. The researcher also found that students did not understand the concepts, facts and techniques needed to solve mathematical problems. The data shows that students have low mathematical literacy skills. This is due to the feeling of boredom felt by students when learning using learning media and teaching materials that are monotonous, not varied, not differentiated, and not multimode. Then, students still make mistakes when working on problems related to conceptual understanding and have not mastered the prerequisite material thoroughly. In addition, learning media and teaching materials are developed with minimal illustrations and are not presented in various formats that combine audio and visual elements (such as ppt, audio podcasts, infographics, explanatory videos, and motion graphics) that can deepen student understanding.The following is the initial design of CPS-based microlearning that has been developed by researchers based on the analysis of learning outcomes and adjusting to the principles of the CPS learning model.

Figure 1. Initial Cover Design of CPS-Based Microlearning

After developing the cover, we continued with the preface, table of contents, microlearning usage guide and character introduction. After that, the researcher designed the initial design of the triggering questions shown in Figure 2 below.

Figure 2. Preliminary design of triggering questions with the principle of understanding the challenge at the step of constructing opportunities

The initial design development integrates the principles of CPS in each learning activity. The following is the initial design of student activities that apply the principle of understanding the challenge in the exploring data step.

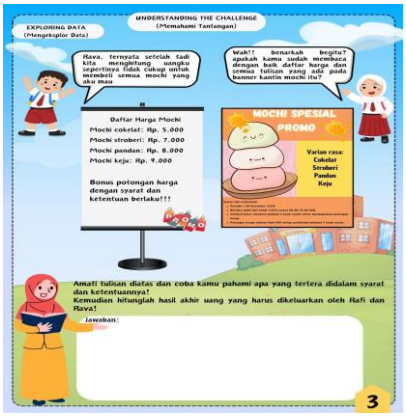


Figure 3. Preliminary Design of Learning Activities that Implement the Understanding the Challenge Principle at the Exploring Data STEP

In the initial design of learning activities that apply the principle of understanding the challenge in Step Exploring Data, students are invited to explore concepts through observing promotional images contained in mochi seller banners. Students are asked orally about it and students tell about their findings. Furthermore, the initial design of learning activities by applying the framing problem principle is shown in figure 4 below.

Figure 4. Preliminary Design of Learning Activities that Implement the Understanding the Challenge Principle at the Problem Frame Step

In the initial design of learning activities that apply the principle of *Understanding The Challenge* in *Step Exploring Data*, students are invited to explore concepts through activities to observe promotional images contained in mochi seller *banners* . Students are asked orally about it and students tell about their findings. Furthermore, the initial design of learning activities by applying the *framing problem* principle is shown in Figure 5 below.

Figure 5. Preliminary Design of Learning Activities Implementing the Generating Ideas Principle

Furthermore, the initial design of learning activities that apply the principle of *preparing for action* is shown in Figure 6 below.

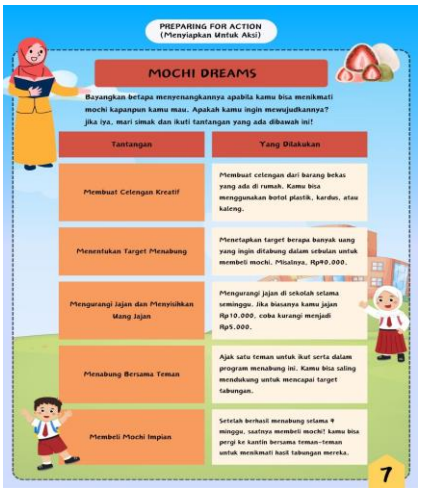


Figure 6. Preliminary Design of Learning Activities that Implement the Preparing For Action Principle

Furthermore, the initial design of the CPS-based question exercise is shown in Figure 7 below.

Figure 7. Initial Design of CPS-Based Practice Questions

Each microlearning on CPS-based money materials has been tested by mathematics and mathematics education experts, design experts, and linguists. The results show that this microlearning is suitable for learning in elementary schools according to the grade level. The following is a summary of the results of the validation of material, design and language experts which can be seen in the table 1 below:

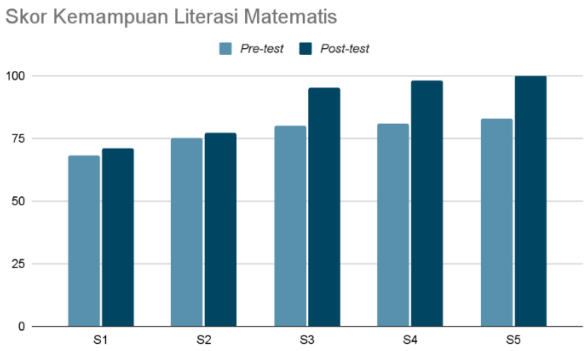
Table 1. Results of Material, Design and Language Expert Validation on Microlearning On Money Material Based on CPS

Aspects	Percentage	Categories
Material	96 %	very feasible
Design	92 %	very feasible
Language	95 %	very feasible
Total Percentage	94,33 %	very feasible

Based on the validation results, it shows that Microlearning on CPS-based money material developed by researchers has a feasibility value of 94.33% and is included in the very feasible category. The details of each aspect, namely the material aspect, get a percentage of 96%. There are suggestions from material experts regarding the writing of currency values that still have errors, grammar and placement of EYD that are still not correct, which is caused by the editing process that has not been maximized, so it needs to be corrected. But from the conceptual side, all topics have been developed appropriately. The next aspect is the design which gets a percentage of 92%. The template used received suggestions from experts to consider the size and scale of each illustration. The next aspect is the language aspect, getting a percentage of 95%. There are still writing errors or typos and need to be corrected. Therefore, based on the validation results, Microlearning on CPS-based money material is very feasible to implement with very minor improvements.

The final product of the microlearning model on CPS-based money material that has been validated is then revised which focuses on improving the design aesthetics and suitability of illustrations to the material, scale and size of illustrations. This can help students understand mathematics literally and improve their mathematical literacy skills. Revisions were made to all microlearning sets on CPS-based money materials. In terms of content, this microlearning not only takes into account changes, learning phases, and context, but also adheres to Brosseau's situational analysis theory, which includes: situational context as input or stimulus, situational context as formula, situational context, situational validation, and Harel related to the Triadic Cycle. This includes context as input or stimulus, mental randomness, flow of thinking, flow of understanding, and context as reinforcement. Improvements made are only limited to the layout or design that is more adapted to the characteristics of elementary school students who are very imaginative. Before implementing the final product of this research, a pretest was conducted to determine the description of the initial abilities possessed by students related to the ability to understand concepts and creative thinking of phase B elementary school students. Then conduct learning with CPS-based microlearning and students are tested again through posttest to obtain an overview of the acquisition and improvement of these two abilities.

The following graph presents the results of the pre-test and post-test of students on mathematical literacy skills.



Graph 1. Results of Pre-test and Post-test of Mathematical Literacy Ability of Elementary School Students

Based on graph 1 above, it can be seen that all students experienced an increase in mathematical literacy skills on money material in phase B elementary school. In addition, to see the quality of this improvement in mathematical literacy skills, researchers measured the improvement using *N-Gain.* The average N-Gain value in this study for mathematical literacy skills is 0.56. Based on the criteria for obtaining the *N-Gain* value, it can be concluded that the improvement in students' mathematical concept understanding ability is included in the moderate category. This means that *microlearning* on CPS-based money material is effective in improving the mathematical literacy skills of phase B elementary school students.

Microlearning development is a process of preparing a set of learning materials that are arranged systematically to help teachers teach material to their students in order to achieve learning objectives. In this process, the learning tools used are text materials, video explanations, infographics, motion graphics, and evaluation tools (Susilana, 2023). In developing microlearning in mathematics subjects in the field of number studies in elementary school, it begins with the design of teaching materials based on mathematical content. Therefore, the development of microlearning is designed based on Creative Problem Solving. The model was chosen because it is relevant to the purpose of this study, which is to improve the ability to understand mathematical concepts and mathematical creative thinking skills of grade 4 elementary school students. The findings of the study underscore the critical role of Creative Problem Solving (CPS)-based microlearning in addressing the learning difficulties faced by elementary school students in understanding money and its conversion. This discussion explores key insights, implications, and areas for further research.

1. **Identifying Learning Gaps and Needs**

   The observations and interviews revealed significant learning barriers, including low student motivation, a lack of diverse and engaging resources, and deficiencies in conceptual understanding. Students' struggles with monotonous teaching materials

and limited multimodal resources highlight the necessity for innovative instructional designs that cater to young learners' developmental needs. These findings align with the literature emphasizing the importance of engaging and varied instructional strategies in elementary education (Clark & Mayer, 2016).

2. **Integration of CPS Principles in Microlearning Design**

   The integration of CPS principles into microlearning activities effectively supports students' exploration and understanding of mathematical concepts. Each stage of the CPS model, from understanding challenges to generating ideas and preparing for action, is strategically designed to engage students in critical thinking and active participation. Activities such as observing promotional banners and solving contextual problems leverage real-world connections to deepen students' understanding, consistent with experiential learning theories (Kolb, 1984).

3. **Validation of Microlearning Design**

   The expert validation results indicate a high feasibility level (94.33%) for the CPS-based microlearning materials, with individual aspects of material (96%), design (92%), and language (95%) scoring in the "very feasible" category. These findings suggest that the microlearning model is well-suited for elementary students, albeit with minor revisions needed for grammar, formatting, and design aesthetics to enhance usability and alignment with students' characteristics.

4. **Impact on Mathematical Literacy**

   The pretest and posttest results demonstrate a moderate improvement in students' mathematical literacy skills, as reflected by an average N-Gain score of 0.56. This improvement validates the effectiveness of CPS-based microlearning in fostering mathematical concept understanding and problem-solving abilities. The integration of multimodal resources (e.g., illustrations, audio-visual aids) and interactive exercises appears to mitigate students' boredom and enhance engagement.

5. **Theoretical Contributions and Practical Implications**

   This study contributes to the theoretical understanding of microlearning and CPS as complementary pedagogical approaches. By grounding the instructional design in Brosseau's situational analysis theory and Harel's Triadic Cycle, the research ensures that the learning activities are contextually relevant and cognitively stimulating. Practically, the findings provide educators with an evidence-based framework for designing microlearning materials that are both engaging and effective in improving numerical literacy.

6. **Limitations and Future Directions**

   While the study highlights significant improvements, the moderate N-Gain score suggests room for optimization. Future research could explore the long-term effects of

CPS-based microlearning on other mathematical domains and investigate its scalability across diverse student populations. Additionally, incorporating adaptive learning technologies may further personalize the learning experience and enhance outcomes.

CPS-based microlearning offers a promising solution for addressing learning difficulties in numerical literacy among elementary school students. By combining theoretical rigor with practical design elements, this approach not only improves students' understanding of money concepts but also fosters their broader mathematical literacy. With further refinement and adaptation, CPS-based microlearning has the potential to transform mathematics education in elementary schools.

CONCLUSION

The initial design of CPS-based microlearning that has been developed includes text materials, PowerPoint presentations, motion graphics, infographics, and assessment tools, all of which are packaged in the form of digital books. The final product of CPS-based microlearning on money material has been revised in accordance with the recommendations for improving the initial design, including improvements to the design or layout components, writing style, colour selection on several pages, and the scale and size of illustrations that need to be adjusted. Based on the results of the implementation of Creative Problem Solving-based microlearning products for grade 4 elementary school students, all students showed an increase in mathematical literacy skills on money materials. This is reflected in the average N-Gain value listed in the discussion section, with a figure of 0.56, which indicates that students' mathematical literacy skills are in the moderate category. Therefore, it can be concluded that the understanding of mathematical concepts of Phase B elementary school students increased after the implementation of CPS-based microlearning.

REFERENCES

Aulia, T. Q., Wahyudin, W., & Junaeti, E. *Implementation Of Interactive Multimedia Based Microlearning Learning With The Discovery Learning Model*

To Increase The Creativity Of Thinking Of Vocational Students. Jurnal Guru Komputer, *4*(2), 57-65.

Aryani, I., Nadia, R., Susanti, M. (2022). *Peningkatan Literasi Numerasi Siswa Sekolah Dasar Jurnal Abdimas UNAYA.*

Baity, N. (2021). *The effect of Creative Problem Solving Learning Models on International Journal of Social Science And Human Research.*

Buchem, I., & Hamelmann, H. (2010). Microlearning: A Strategy for Ongoing Professional Development.

Christina, M., & Nindiasari, H. (2022). *Efektivitas Flipped Classroom Diintegrasikan Model Creative Problem Solving Terhadap Kemampuan Numerasi Siswa SMA*. *Jurnal Ilmiah Wahana Pendidikan*, *8*(22), 325-332.

Clark, R. C., & Mayer, R. E. (2016). *E-Learning and the Science of Instruction: Proven Guidelines for Consumers and Designers of Multimedia Learning*. Wiley.

Ginsburg, H. P. (2006). *Mathematical Thinking and Problem Solving*. Academic Press.

Handayani, S. L., & Amaliyah, L. R. (2022). *Creative Problem Solving (CPS) Berbantuan Google Meet:Pengaruhnya terhadap Kemampuan Analisis Siswa Sekolah Dasar. Edukatif:Jurnal Ilmu Pendidikan*, *4*(3), 4939-4947.

Hug, T. (2005). *Microlearning: A New Pedagogical Challenge*. In *Proceedings of the Microlearning Conference*.

Hug, T. (2007). *Didactics of Microlearning: Concepts, Discourses, and Examples*. Waxmann Verlag.

Johnson, D. W., & Johnson, R. T. (1999). *Learning Together and Alone: Cooperative, Competitive, and Individualistic Learning*. Boston: Allyn & Bacon.

Kementrian. (2017). *MATERI PENDUKUNG LITERASI NUMERASI. Jakarta: Kementerian Pendidikan dan Kebudayaan.*

Khoirunnisa, A. F., Iriawan, S. B., & Giwangsa, S. F. (2022). *PENGEMBANGAN BAHAN AJAR DIGITAL BERBASIS MICROLEARNING DALAM PEMBELAJARAN MATEMATIKA DI SEKOLAH DASAR*. *Jurnal Pendidikan Guru Sekolah Dasar*, *9*(1), 31-37.

Koper, R. (2010). *Learning Design: A Handbook on Modelling and Delivering Learning in a Digital Age*. In *Educational Technology & Society*.

Kesumawati, N., Fuadiah, N. F., Lusiana, L., & Octaria, D. (2023). Teaching Materials for Algebra and Linear Programs Based on Pancasila Student Profiles. *Jurnal Riset Pendidikan Matematika*, *10*(1), 65–77. https://doi.org/10.21831/jrpm.v10i1.55392

Lucky, Y. (2023). *Pengaruh model pembelajaran creative problem solving terhadap kemampuan pemecahan masalah matematis siswa. Jurnal AKSIOMA: Jurnal Program Studi Pendidikan*, *12*(1), 1408-1416.

Lumsdaine, E., & Lumsdaine, M. (1995). *Creative Problem Solving: Thinking Skills for a Changing World.* McGraw-Hill.

Mayer, R. E. (2005). *The Cambridge Handbook of Multimedia Learning*. Cambridge University Press.

Nurazmi, I. FitrianiI, A. D., & Riyadi, A. R. (2024). *PENGEMBANGAN PERANGKAT MEDIA PEMBELAJARAN BERBENTUK MICROLEARNING MATERI OPERASI HITUNG DAN PENGURANGAN BILANGAN BULAT DI SEKOLAH DASAR. Jurnal Pendidikan Sekolah Dasar.*

Nugraha, H., Rusmana, A., Khadijah, U. L. S., & Gemiharto, I. (2021). *Microlearning sebagai upaya dalam menghadapi dampak pandemi pada proses pembelajaran.* Jurnal Inovasi dan Teknologi Pembelajaran (JINOTEP): Kajian dan Riset Dalam Teknologi Pembelajaran, 8(3), 225-236. OECD. (2016). *Skills Matter: Further Results from the Survey of Adult Skills*. Paris: OECD Publishing.

Putri, O. W. (2023). *PENGARUH MODEL PEMBELAJARAN CREATIVE PROBLEM SOLVING TERHADAP KEMAMPUAN PEMECAHAN MASALAH MATEMATIKA. Jurnal Wawasan dan Aksara.*

Reiter-Palmon, R., & Illies, J. J. (2004). *Leadership and creativity: Understanding leadership from a creative problem-solving perspective.* Psychology Faculty Publications, 31.

Setiada, T. B., Fatirul, A. N., & Waluyo, D. A. (2022). *Pengembangan Pengembangan Microlearning pada Materi Getaran, Gelombang dan Bunyi dalam Kehidupan Sehari-Hari untuk Peserta Didik Kelas VIII Sekolah Menengah Pertama*. *Science and Physics Education Journal (SPEJ*, *6*(1), 1-7.

Ulupui, I.G. (2021). *Microlearning Cooperatives And Msmes: Increasing Accounting Competence Trough The. Jurnal Abdi Insani Universitas Mataram.*

Wulandari, A. N. (2023). *Pengaruh Model Pembelajaran Creative Problem Solving Terhadap Numerasi Kelas V Di SDN Pujer Baru 2.* Jurnal Edukasi dan Penelitian Tindakan Kelas, 2(1), 18-27.