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Developing Microlearning Through Creative Problem Solving and Productive Struggle to Enhance Elementary Students' Mathematical Conceptual Understanding and Mathematical Creative Thinking Skills

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A B S T R A C T

Students' difficulties in understanding mathematical concepts contribute to their low level of mathematical understanding. These difficulties include reliance on memorization, errors in selecting and applying formulas, difficulties in connecting mathematical concepts, and misconceptions about basic concepts. Such conditions may hinder the development of students' mathematical creative thinking skills in solving mathematical problems. This study aimed to develop a microlearning resource based on the Creative Problem Solving and Productive Struggle models. The microlearning incorporated text-based materials, explainer videos, motion graphics, infographics, and assessment tools. The study employed the Didactical Design Research (DDR) method. Data were collected using questionnaires and tests measuring students' mathematical conceptual understanding and mathematical creative thinking skills in number concepts. The findings showed that: (1) the initial design was aligned with the Creative Problem Solving model and Productive Struggle principles; (2) expert validation indicated that the microlearning was highly feasible; (3) revisions based on expert feedback produced an appropriate final product; and (4) pre-test and post-test comparisons showed improvements in students' conceptual understanding and mathematical creative thinking skills, as indicated by effective N-Gain scores. Thus, the developed microlearning is a feasible alternative resource for supporting mathematics learning among Phase A elementary school students.

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A R T I C L E I N F O

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1. INTRODUCTION

One of ability the important basics for owned by oneself learners namely mathematical conceptual understanding ability (Nurfajriyanti, et.al, 2021). When students own mathematical conceptual understanding ability students capable construct meaning and intent objective from learning mentioned. Understanding that alone means process, action, way understand or to understand every material the learning provided, especially learning mathematics (Nurfajaiyanti, et.al, 2021). From the mathematical conceptual understanding said, students can develop information obtained become mathematical conceptual understanding material said , so that student will Can think in a way creative as well as student can understand mathematical conceptual understanding.

Therefore that, the foundation important thing to do owned by participants educate in his efforts For think finish problem mathematics and also problem in life everyday, is mathematical conceptual understanding ability. The importance of mathematical conceptual understanding ability is also explained in principle learning mathematics as stated by the National Council of Teaching Mathematics (NCTM, 2000), namely : " participants educate must Study mathematics with understanding , in active build knowledge new from experience and knowledge previously." Principle This based on the idea that Study mathematics with understanding is important. Learn mathematics No only need skills count but also requires skills For think and reason in a way mathematical conceptual understanding for finish questions new and learn new ideas that will faced by participants educate in the future come (Van De Walle, 2006).

Mathematical conceptual understanding that alone aiming For help student understand, know, and be able to disclose return material that has been delivered, not only just memorize formula or sentences that have been given by the teacher or source the students ' reading read . This is in harmony with research conducted by (Putra, et.al, 2018) that things that influence low mathematical conceptual understanding ability. Because of learners enough capable explain or pour return the concept that they get and serve draft in form representation mathematical conceptual understanding that learners not enough will mathematical conceptual understanding ability. Besides it's also a level mathematical conceptual understanding student can measured through results workmanship the question that has been done by students (Nurfajriyanti, 2021). Level the in the form of level understanding high , medium or high concepts low. So that student can measure and know whether student the Already understand to material or only memorize the formula that has been there is.

Regardless importance understanding mathematical conceptual understanding owned students , reality understanding mathematical conceptual understanding ment understand be one of reason from why mathematichal conceptual understanding student still low. Difficulty moment understand what is found Because student more Lots use memorization without know reason formula used wrongly used formula, inability student in to hook concepts contained in question (Fadzillah & Wibowo, 2016) as well mistake draft base mathematics so that result in when learn draft next will difficulties (Jarmita, 2015). The difficulties that experienced student will result in understanding lack of mathematics maximum and of course hinder mathematical creative thinking skills in solve problem mathematics. Students who experience difficulty need own effort For overcome difficulty in understanding mathematics will to be optimal. Skills a individual who continues endure moment experience hardship and persistence For get desired goal named as Power struggle productive or productive struggle (Stolz & Paul, 1997).

Wardani & Saidiyah (2016) argues somebody with high productive struggle No will ignore obstacles that prevent it successful, enough capable overcome challenge with utilise part from its potential and has an easy taste recover from failure as well as can face challenge next (Triwibowo, et.al, 2018). Therefore that, in learning mathematics Power struggle is one of important things (Astiantari et.al, 2022; Hakim, 2020, Hiebert et.al, 2007; Triwibowo et.al, 2018). Power the struggle that moves student to direction understanding, reasoning and comprehension mathematics is understanding from productive struggle (Warshaueur, 2015). Important for student own power struggle productive. Because with know power struggle productive students, can give description like what struggle productive student in a natural environment in the classroom that can give outlook about How aspects teaching can supportive and useful for understanding student to mathematics (Hiebert et.al, 1993; Killpatrick, 2009; Melani & Herman, 2023). Some study related Power struggle productive find that students involved in struggle when do mathematics has reach level more performance high and get important benefits in evaluation mathematics they (Hiebert et.al, 1993; Kapur, 2016; Rahmi, 2021; Stein et.al, 1996; Wulandari, 2019).

A number of results research also states that one of difficulty happen Because not enough existence mathematical conceptual understanding Mathematical conceptual understanding ability is very necessary For control teaching materials that contain Lots formula for students can understand concepts in material the in a way intact as well as skilled use various procedure inside it in a way flexible, accurate, efficient and precise in breakdown problem mathematics (Wulandari, 2019). Therefore that, it is necessary existence effort optimize mathematical conceptual understanding ability students, one of them is choose a learning model that can optimize mathematical conceptual understanding ability students. Of the many learning models that exist, I interested with one of the learning models mathematics that can increase ability judgment concept and thinking creative in breakdown problem mathematical student is Creative Problem Solving. First introduced by Osborn (Warshaueur, 2015) in book the pioneer Applied Imagination, has undergo more from 60 years research and development (Puccio, et.al, 2020). More continue, Paryanto & Kurniasih (2020), states that Creative Problem Solving is a learning model that focuses on teaching and skills breakdown problem , which is followed with strengthening skills. When faced with with question or problems , students can do skills solve problem For select and develop his response. No only with method memorize without thought, skills breakdown problem expand the thinking process.

Creative Problem Solving is variation from learning settlement problem with systematic technique in organize idea creative For finish a problems (Lestari & Yudhanegara, 2015; Pepkin, 2004; Turmuzi et.al, 2018). According to Nurfajrianti (2021), Creative Problem Solving includes in learning models with approach constructivist, which is center learning is students (tudent centered) so that considered capable activate students. Learning models Creative Problem Solving can used on students with ability diverse intellectuals. Learning models Creative Problem Solving does not only limited to the level introduction, understanding and application A information, but also training student for can analyze a problems and solve them . Creative Problem Solving will researcher integrate in a form of microlearning on the mathematics subject in accordance with characteristics and needs student 21st century. Microlearning is meant in the form of text teaching materials, motion graphics, video explainers, infographics and digital assessment tools.

2. RESEARCH METHODOLOGY

Method study which will used in study this is didactical design research. Which covering

stage analysis prospective, analysis metapedadidactis, and analysis retrospective (Suryadi, 2019a; Suryadi, 2019b). Analysis prospective is analysis before learning to situations didactics contained in the device learning elementary school mathematics field study Number used by participants phase A (generally class 1 and 2). Analysis prospective also done to difficulties Study learners (learning obstacles) well in a way ontogenic, epistemological, and didactic, when learning Mathematics on field study Number use device learning ordinary mathematics used by teachers and students.

Analysis results prospective in the form of track Study guess(hypothetical learning trajectory), anticipation didactic pedagogical, and framework design didactic packed in form design beginning microlearning which willused in learning differentiate in accordance with principles on Kurikulum Merdeka. Analysis furthermore is analysis metapedadidactic during learning in progress which done through observation, interview, and documentation for take notes findings during learners Study Mathematics on field study number use design beginning microlearning differentiate which has developed. Findings during learning in progress reflected in a way critical through analysis retrospective after learning in progress For get design end microlearning learning differentiate based on findings results analysis metapedadidactic. Subject study is 21 students 2nd grade at an elementary school in Bandung City.

As for the flow study shown in Figure 1 below.

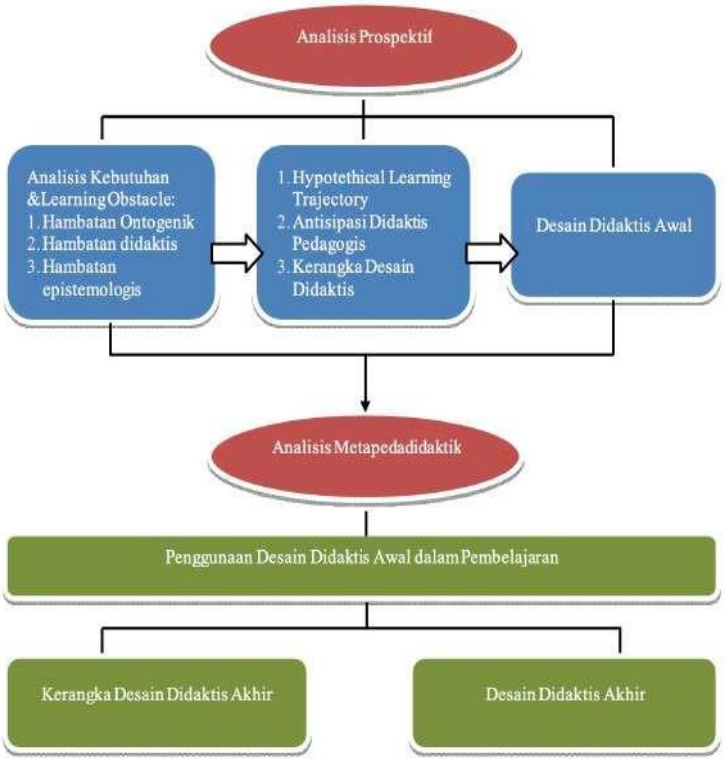


Figure 1. Flowchart of Didactic Design Research Development Microlearning Learning Mathematics Subjects Based on Creative Problem Solving and Productive Struggle

3. RESULT AND DISCUSSION

Before designing microlearning based on Creative Problem Solving and Productive Struggle in the field study numbers in elementary school phase A, researchers do observation and study introduction for know difficulty Study students in the field study number, then researcher do testing test difficulty Study student 2nd grade at an elementary school in West Bandung City, West Java as location continued research with interview in a way deep. The result of course proven that the average student experiences difficulty study in the field study The number caused motivation low learning during learning taking place. Besides that, researcher find that student No understand draft mathematical conceptual understanding and only can do question mathematics in nature mechanistic and procedural, not capable do matter of nature test understanding conceptual. Based on these data, researchers conclude that student has experience obstacle dominant learning in the form of obstacle Study ontogeny. This is related with error students who are still wrong in do question related understanding conceptual and not yet control material prerequisite with intact caused boredom and boredom during learning using learning media and shaped teaching materials monotonous teaching materials, no varied, no differentiated, and not multimode. In addition that is, learning media and teaching materials are developed with minimal illustrations and are not packed in various form containing element audio and visual (ppt, infographics, video explainer, and motion graphics) for strengthen understanding students. Besides that, other obstacles that occur to students is obstacle didactic that is obstacle learning that comes from the teacher when convey draft certain which are very minimal with context. In general, teachers explain material subject mathematics in a way direct without started with context, as well as learning media and shaped teaching materials The teaching materials used are very minimal context, whether personal, work, social culture, as well as scientific.

Obstacle Study the can overcome with method make learning that is done must emphasize on planting correct concept, accompanied by relevant illustrations and context for strengthen understanding students, as well as digital learning media and teaching materials in the form of microlearning facilitates diversity characteristics and needs study students (differentiated) and packaged in a way microlearning in various form (text written, ppt, infographics, video explainer, and motion graphics) with amount page that is not pages (maximum 10 pages) and duration time that is not too long (between 3 to 5 minutes) to overcome obstacle Study ontogeny in the form of boredom and boredom student during learning ongoing.

After know and analyze difficulty or obstacle study mathematics students in the field study numbers, next researcher compile track study guess for learning elementary school mathematics in the field study number. Track study guess This help answer a number of question about objective What will achieved , how getting started and what teaching materials are relevant with characteristics elementary school students, how step Study furthermore with use teaching materials, how method study involving teaching materials so that objective study achieved. This is done so that learning mathematics No mechanistic, no boring and done in a way gradually in accordance with stages think student with involving diverse form teaching materials, illustrations, and context so that student can to give meaning to material subject mathematics in progress studied.

Compilation track Study guess This done based on achievement learning mathematics subject on elements Number in accordance the phase that has been formulated by the Ministry of Education and Culture (Kemdikbud) in the BSKAP Decree Number 032 of 2024 which is for special elementary school level in phase A (generally class 1 and class 2). Furthermore, the researcher to compose one form syllabus in Independent Curriculum, namely the Objective Flow Detailed learning become indicator objective learning in accordance with uniqueness of

the Kurikulum Merdeka.

Anticipation didactic pedagogical (ADP) was developed For predict response student during learning in progress use microlearning field study number based on Creative Problem Solving and Productive Struggle which has developed, then compile steps intervention anticipatory learning in accordance with response student when learning with use microlearning field study number based on Creative Problem Solving and Productive Struggle which has developed and poured it out to in Plan Implementation Learning (RPP) and its accessories. The forms are: response student categorized to in three category difficulty learning, namely difficulty Study related mathematics teaching materials who does not interesting or not enough aesthetic so that not enough motivate student for learning (difficulty Study ontogenic), difficulties Study related teaching materials that are not to learn student in a way gradual (difficulty study epistemological), and difficulties study student because lack of context diverse in teaching materials (difficulties Study didactic).

Students who are struggling to form channel understanding will anticipated by each other various results work so that woke up intersubjectivity and explanation by the teacher to validate truth results think student based on concept scientific. So that material that has been studied meaningful for students, then situation institutionalization done with give problem contextual, real, or mathematical conceptual understanding for done by students. Students who have difficulty respond problem as situation institutionalization will anticipated with give intervention in the form of explanation step work or with bring up problem with easy context understood student.

After researcher make channel anticipation didactic pedagogical (ADP), researcher start to design prototype microlearning field study number based on Creative Problem Solving and Productive Struggle are one of them its shape can seen in the following figure 2 this.



Figure 2. Prototype Cover Front Microlearning mathematics subject field study number based on Creative Problem Solving and Productive Struggle

On the cover front Microlearning mathematics field study number based on Creative Problem Solving and Productive Struggle This will listed title from teaching materials, targets user teaching materials namely student class II school basic, image figure main Ezan and Zea, illustration picture numbers and identities Name maker on part right below. Prototype furthermore is the prototype of the foreword shown in Figure 3 below.



Figure 3. Prototype of Foreword Microlearning mathematics subject field study number based on Creative Problem Solving and Productive Struggle

Making prototype researcher do it to all the page to be developed become design beginning Microlearning mathematics subject field study number based on Creative Problem Solving and Productive Struggle. After making prototype finished, researcher choose figure Ezan and Zea as cast the main thing that will be interact in a way textual with students. Illustration This chosen with use help application canva. Here This is his character.



Figure 4. Characters Ezan and Zea

After make choose character characters and illustrations the image that will be used in teaching materials, researchers start to design design beginning Microlearning Based on CPS and Productive Struggle. Design design beginning Microlearning Based on CPS and Productive Struggle the customized with prototype that has been made previously. Figure 5 below show developed microlearning cover based on prototype previously.



Figure 5. Initial Front Cover Design Microlearning CPS Based and Productive Struggle

After develop cover, continued by compiling a foreword, table of contents, guide use of microlearning and recognition figure. After that, researcher to design design beginning question the lighter shown in the following figure 6 this.



Figure 6. Initial Question Design Igniter Microlearning CPS Based and Productive Struggle

Development design beginning to be continued with integrate *Creative Problem Solving* and *Productive Struggle* in every activity learning. Here This is design beginning activity Come on observe based on the principle of “clarification problem” on CPS and principles "telling" on *productive struggle.*



Figure 7. Initial Design of the Microlearning “Let’s Observe ” Activity CPS Based and Productive Struggle

On design beginning This “Let’s Observe ” activity student invited For explore draft through activity observe picture member body and count the amount member his body based on principle clarification problems and *telling.* Students asked in a way oral about

matter and students tell a story about his findings. Next, the initial design of "Let's Answer" developed Already in accordance with the prototype that was developed based on principle of "Disclosure The Idea" of CPS and Principles *"Directed Guidance"* from *Productive Struggle* Next design at first shown in Figure 8 below this.



Figure 8. Initial Design of the "Let's Answer " *Microlearning* Activity CPS Based and *Productive Struggle*

Next, the researcher to design the beginning of "Let's Answer" developed Already in accordance with the prototype in accordance the "Evaluation and Selection" principle of CPS and the Principle *"Probing Guidance"* from *Productive Struggle*. Here This design initially:

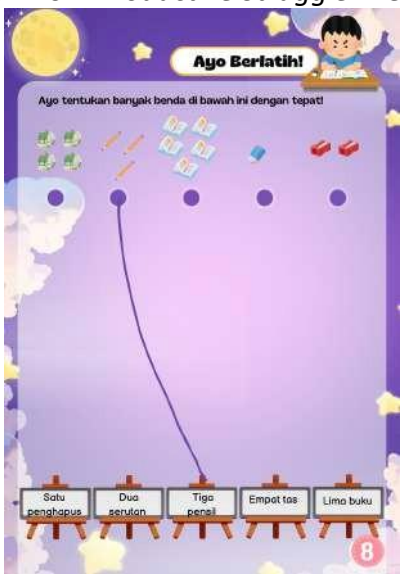


Figure 9. Initial Design of the "Let's Practice " *Microlearning* Activity CPS Based and *Productive Struggle*

Next, the researcher to design design beginning "Let's Try" activity based on the "Implementation" Principle of the CPS Model and the Principle Teacher Response *"Affordance"* from *Productive Struggle*. The initial design of "Let's Try" developed Already in accordance with the prototype. Here design initially.

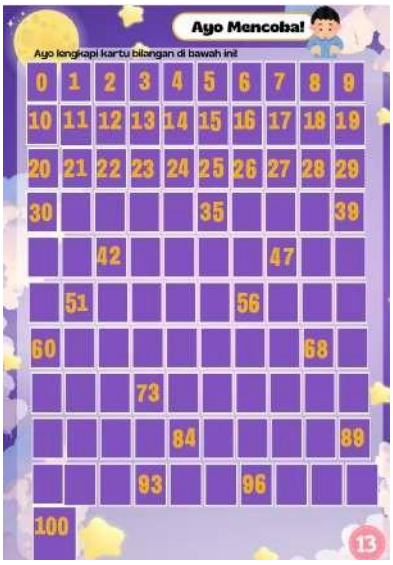


Figure 10. Initial Design of the "Let's Try" *Microlearning* Activity CPS Based and *Productive Struggle*

Finally, development design beginning "Let's Practice " activities through *Scan Barcode*. The initial design of "Let's Answer" developed Already in accordance with prototype. Through barcode, students can enter to the assessment tools and got evaluation about material that has been studied. The following design initially.



Figure 11. Initial Design of the "Let's Practice" *Microlearning* Activity CPS Based and *Productive Struggle*

All *microlearning* in the field study number based on CPS and *productive struggle* that has developed has validated by experts material mathematics and education mathematics, expert design as well as expert Language with criteria worthy For used in learning in elementary school according to level class. Following is summary results validation expert materials, design and language that can seen in Table. 1 below.

Table 1. Results of Expert Validation of Material, Design and Language in *Microlearning* in the Field of Number Studies CPS Based And *Productive Struggle*

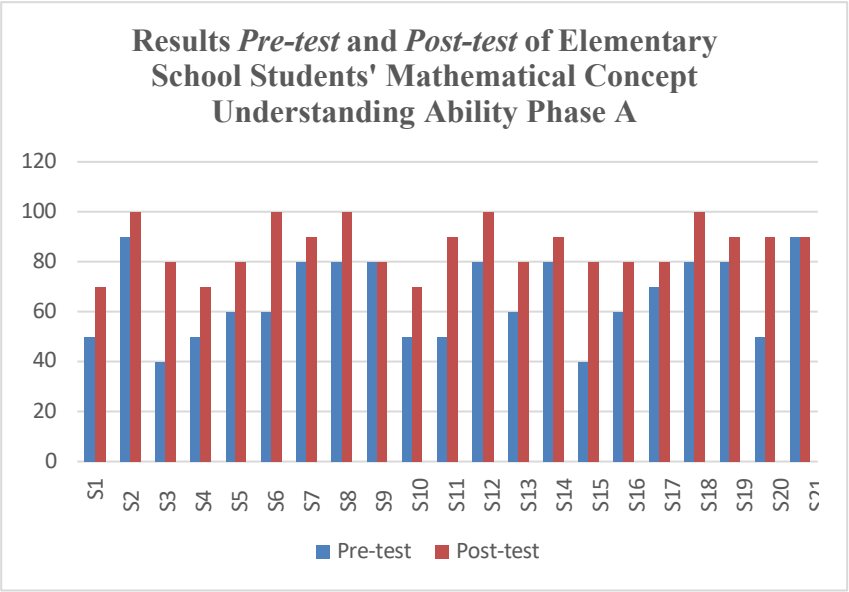
Aspect	Presentation	Category
Material	95.25%	Highly Feasible
Design	92.5%	Highly Feasible
Language	96%	Highly Feasible
Total Percentage	94.58%	Highly Feasible

Based on results validation show that *Microlearning* in the Field of Number Studies Based on CPS and *Productive Struggle* developed researcher own mark eligibility is 94.58% and is included in the very feasible category. The details are as follows from each aspect namely in the aspect material get presentation by 95.25%. There are suggestions from expert material related writing number unfinished fractions in accordance with rules, due to the editing process that has not been maximum, so that need fixed. However from side conceptual, all Topic Already developed with right. The next aspect that is design that gets percentage by 92.5%. On the *template* used get advice from expert so that consider level contrast of writing and *background. The* next aspect that is aspect language, get percentage by 96%. There are still error writing or *typo* and necessary fixed. Based on results validation, *Microlearning* in the Field of Number Studies CPS Based And *Productive Struggle* is very worthy For implemented with very minor improvements .

Product end of *microlearning* model in the field study number CPS based and *productive struggle* which has analyzed in a way retrospective based on findings when implementation learning furthermore revised with focus repair or revision on attractiveness or aesthetics design For overcome obstacle learning in nature ontogeny For Motivate student Study mathematics use *microlearning* in the field study number CPS based and *productive struggle* which has developed. Revision done to all *microlearning* sets on the field study number based on CPS and *productive struggle.* From the side content, *microlearning* in the field study number CPS based and *productive struggle* is not experience changes, stages learning, and context as well as still accommodate theory situation didactic Broseau [11] which consists of on situation action, situation formulation, situation validation, and situations institutionalization and Harel [1] related Triadic Cycle, includes problem contextual as input or stimulus, random mental actions, flow thinking, flow understanding, and problems contextual institutionalization as strengthening. Repair only done to design or packaged layout more colored with relevant images with characteristics happy elementary school students imagine.

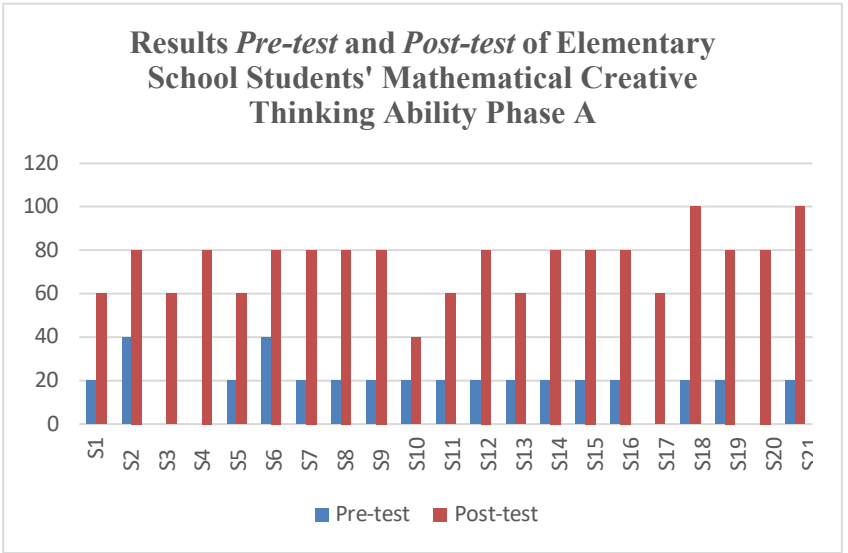
Before implemented product end study this, *pretest* done For know description ability beginning student related mathematical conceptual understanding ability and mathematical creative thinking skills elementary school students phase A. Then it was carried out learning with CPS and PS based microlearning and students Retested through *posttest* For to obtain description acquisition and improvement second ability.

Following served chart results participant *post-test* educate on mathematical conceptual understanding ability following this.



Graph 1. *Pre-test* and *Post-test* Results Mathematical Conceptual Understanding Elementary School Students Phase A

Based on graph 1 above, can seen that all over student experience improvement mathematical conceptual understanding ability in the field study numbers in elementary school phase A. In addition that, for see quality mathematical conceptual understanding ability this , researcher measure improvement the with use *N-Gain.* The average N-Gain value in the study This For mathematical conceptual understanding ability that is of 0.59. Based on criteria acquisition mark *N-Gain* can concluded that improvement ability mathematical conceptual understanding conceptual understanding students included in the category medium. That is, *microlearning* field study number CPS based and *productive struggle* effective in increase mathematical conceptual understanding ability Elementary school students phase A. Furthermore for know ability beginning, acquisition and improvement ability think mathematical conceptual understanding Elementary school students phase A researcher serve in graph 2 below this.



Graph 2. *Pre-test* and *Post-test* Results Mathematical Ceative Thinking Skills Elementary School Students Phase A

Based on graph 2 above, can seen that only 19% of students have ability beginning mathematical creative thinking skills, the rest get zero score. After Study with *microlearning* CPS based and *productive struggle*, all student show acquisition mathematical creative thinking skills. For see improvement mathematical creative thinking skills in the field study numbers in elementary school phase A researchers measure improvement the with use *N -Gain. The* average N-Gain value in the study This For ability think creative mathematical conceptual understanding that is of 0.68. Based on criteria acquisition mark *N-Gain* can concluded that improvement mathematical creative thinking skills and conceptual understanding student included in the category medium. That is, *microlearning* field study number CPS based and *productive struggle* Enough effective in increase mathematical creative thinking skills and mathematical conceptual understanding elementary school students phase A. However, in 19% of students, changes not enough significant after Study with *microlearning* field study number based on CPS and *productive struggle*. This is become findings important and necessary reinforced with result data observation and interview to students. Based on scale evaluation *productive struggle* student obtained data as following.

Table 2. *Productive Struggle* Value Acquisition Student During Learning with *Microlearning*

No.	Name	Aspect				Average
		Ask	Push	Giving Time	Endure	
1	S1	2.6	2.9	3.0	2.5	2.8
2	S2	2.6	2.9	2.8	3.0	2.8
3	S3	2.4	3.0	3.0	2.5	2.7
4	S4	2.9	2.9	2.8	3.0	2.9
5	S5	2.6	2.8	3.0	3.0	2.8
6	S6	2.9	2.9	3.0	3.0	2.9
7	S7	2.5	3.0	3.0	3.0	2.9
8	S8	2.9	2.8	2.6	2.0	2.6
9	S9	2.8	2.6	3.0	2.5	2.7
10	S10	2.5	3.0	3.0	3.0	2.9
11	S11	2.9	2.8	3.0	2.0	2.7
12	S12	2.9	3.0	3.0	2.8	2.9
13	S13	3.0	3.0	3.0	3.0	3.0
14	S14	3.0	3.0	3.0	3.0	3.0
15	S15	2.9	3.0	3.0	3.0	3.0
16	S16	2.8	2.6	3.0	2.8	2.8
17	S17	2.8	2.9	2.6	2.5	2.7
18	S18	2.8	2.9	2.6	2.8	2.7
19	S19	3.0	3.0	3.0	3.0	3.0
20	S20	2.9	3.0	3.0	2.8	2.9
21	S21	2.8	3.0	3.0	2.5	2.8
Average		2.8	2.9	2. 9	2. 7	2. 8

Based on table results scale evaluation *productive struggle* to students conducted by researchers, each students average productive struggle score for in a way overall average is 2.7. This is means, the average student is in the category currently in do *productive struggle* in accordance guidelines evaluation *productive struggle* on a scale of 1-4. If the value is between 2-3 then the category moderate. However, looking at the average value for every aspect , aspect push and give time get highest value that is of 2.9 and the aspect ask get value 2.8. Aspects of

productive struggle that get mark the smallest is aspect endure that is of 2.7. Based on results observation researcher, one of the weakness student in do question mathematics in class this , especially at the time measured mathematical creative thinking skills is the valley Power stand they are at the moment experience deadlock and easy give up, so that no answer become decision students in condition which resulted in get mark zero for every question. Besides that, from aspect ask, lack of desire for look for know more in about material to teachers also become obstacle study they. Most of them student tend silent and resigned moment experience constraints. In the aspect give time they tend passive and less utilise time available. Lastly on the aspect push, tendency student not enough try in a way maximum and tend to fast feel satisfied with results the answer without inspection repeat.

Development *microlearning* is a process of compilation a set material structured learning in a way systematic For help teachers teach material to learners in frame reach objective learning in the form of material text, *video explainer, infographics, motion graphics* and *assessment tools*. In developing microlearning in mathematics subject matter field study numbers in elementary school, starting with with design teaching materials based on content mathematics (Fadzillah & Wibowo, 2016). Therefore that, development *microlearning* This designed based on *Creative problem solving* and *productive struggle.* that model chosen Because relevant with objective study This that is want to increase mathematical conceptual understanding and ability think creative mathematical Elementary school students phase A.

Microlearning field study number based on *Creative problem solving* and *productive struggle* This made in the form of appropriate digital teaching materials with one of type teaching materials according to Ellington and Race (Nur, et.al, 2013). Digital teaching materials are chosen so that students can with easy access this teaching material and can used For learn , where only and when just with Who only. This *microlearning* researcher complete with *barcode* that can scanned so that teaching materials can accessed digitally using technology. Researchers develop digital teaching materials that can facilitate student For Study in a way independent. This is in line with opinion (Lestari & Yudhanegara, 2015) that module is part from compiled teaching materials in a way systematic containing objective learning that enables student For Study in a way independent .

In compile good teaching materials must notice a number of components. This is in line with opinion [2] that teaching materials are said good if in it there is instruction learning, goal learning that is intended achieved, information support, training , and evaluation. Likewise with what is done researchers, all aspect design good teaching materials Already conducted by researchers . The results can see attachment.

Making *Microlearning* field study number based on This *Creative Problem Solving* and *Productive Struggle* integrate principles of the CPS learning model according to Karen [28] that is clarification problems, strategic planning, evaluation and selection as well as implementation. In addition that, the development of microlearning also pays attention to principles *productive struggle* according to [28] such as *telling, directed guidance, probing guidance* and *affordance.*

After the manufacturing process design beginning *microlearning* field study number based on *Creative problem solving* and *productive struggle* finished, continued with validation by experts materials, design and language. Activities validation This in accordance with one of principle development teaching materials according to Nieveen (Putra, et.al, 2018) namely principle validity refers to validation expert. The result, *microlearning* field study number based on *Creative problem solving* and *productive struggle* are declared very feasible for implemented in learning mathematics in school.

Product end *microlearning* field study number based on *Creative problem solving* and *productive struggle* obtained after revision based on the suggestions from the validator. There

are a number of enter among them from vulnerable side of the layout changed especially in writing number fractions, still there is *typos* and considerations election color on some page to be more contrast and easy read. These suggestions become material reflection researchers and repaired with maximum.

After *microlearning* field study number based on *Creative problem solving* and *productive struggle* are completed revised, the researcher also conducted a pre-test on student For to obtain description ability beginning student about mathematical conceptual understanding ability and mathematical creative thinking skills. Through a pre-test instrument consisting of out of 10 questions description student tested on mathematical conceptual understanding ability and 5 questions description For measure mathematical creative thinking skills. Based on *posttest and n-gain test* obtained data that mathematical conceptual understanding ability student is in the category high. However, in terms of ability think creative mathematical student is in the category currently with Lots findings interesting Where student get low value that is zero, even No There is improvement The same very for 33% of students even though Already Study with *microlearning* field study number based on *Creative Problem Solving* and *Productive* Struggle.

This matter reinforced by the results observation researcher, one of the weakness student in do question mathematics in class this, especially at the time measured mathematical creative thinking skills is the valley Power stand they are at the moment experience deadlock and easy give up, so that No answer become decision students in condition which resulted in get mark zero For every question. Besides that, from aspect ask, lack of desire For look for know more in about material to teachers also become obstacle study they. Most of them student tend silent and resigned moment experience constraints. In the aspect give time they tend passive and less utilise time available. Lastly on the aspect push, tendency student not enough try in a way maximum and tend to fast feel satisfied with results the answer without inspection repeat. Findings the become reflection for researcher For truly notice principles implementation of productive struggle according to Booaler (Nurfajriyanti &pradipta, 2021) including: call on students who may not have the correct answer then guides students in the process of questioning their thinking, Give students informative feedback. Provide context to help course students correct toward the solution raise students for perseverance in problem solving, not for being smart. They'll be more motivated to face challenging problems and display work that shows creative problem solving, not the highest scores. Students will learn to value the struggle toward a learning goal. It turns out good teacher response is very supportive productive struggle student.

4. CONCLUSION

Difficulty Study students in the Mathematics the field of Number Studies in general difficulty in understand draft numbers and their operations in elementary school phase A are due to the design teaching materials used in learning mathematics during This not enough load less contexts relevant and diverse and packaged No involving ICT but in One form (monomode) shaped text with minimal illustrations, boring and dull for students and raises obstacle Study ontogenetic and didactic. Tracks Study guess For overcome obstacle Study ontogenetic, epistemological, and didactic formulated based on achievement learning in accordance phase in elementary school in BSKAP Decree Number 032 of 2024 which has compiled by the Ministry of Education and Culture, Trajectory Study guess follow channel Study mathematics) related Triadic Cycle, includes problem contextual as input or stimulus, random mental actions, flow thinking, flow understanding, and problems contextual institutionalization as strengthening.

Initial design *microlearning* CPS based and *productive struggle* which has developed, consisting of top: material text, *power point, motion graphics, infographics* and *assessment*

tools that are packaged in One unity digital book. The results of the implementation learning

show that student No Again experience obstacle Study ontogenetic, epistemological and also didactic, because this microlearning Already arranged with involving ICT, more interesting, colorful, using relevant images with characteristics elementary school students, and packaged with aesthetic. Products end *microlearning* CPS based and *productive struggle* which has developed Already revised based on recommendation repair design start on component design or layout, improvements to the layout and selection of color on some page to appear contract with text. Improvement mathematical conceptual understanding ability after implementation *microlearning* CPS- based and *productive struggle* are in the category tall whereas improvement mathematical creative thinking skills still is in the category currently.

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