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Didactical Situation of Learning Integer Material based on Local Culture to Support Student Numeracy Literacy

Yohanis Ndapa Deda [1*], Hermina Disnawati [1], Otaget Daniel [2], Suhendra [3], Darhim [3]

[1] *Universitas Timor, Indonesia*

[2] *Kyambogo University, Uganda*

[3] *Universitas Pendidikan Indonesia, Indonesia*

yndapadeda@unimor.ac.id*

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ABSTRACT

Didactically oriented research that considers the relationship between teachers, students and materials was vital. This research aimed to obtain an overview of the didactical situation in the learning process of whole number concepts as a basis for designing appropriate learning designs based on local culture for junior high school students in North Central Timor. The research method followed the stages of Didactical Design Research (DDR). The research instruments were observation sheets, interview guidelines, and documentation. Data analysis included prospective analysis, observation data, and post-observation data. The results revealed that student preparedness for learning posed a barrier to the otherwise smooth operation of instructor, student, and material interactions. Learning the concept of mixed operations of whole numbers was successful in terms of learning objectives achieved and learning that took place according to plan. The research concluded that the existence of the Topaze Effect and the Aging of Teaching Situations when learning whole number operations in the classroom. Didactical situated research contributes to define the scope and substance of didactics, focusing on the shared values and knowledge that underpin effective numbers instruction.

Keywords: *Didactical Situation, Integers, Local Culture, Numeracy Literacy*

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INTRODUCTION

Numeracy literacy (NL) is a skill that everyone should have. It is essential to opening the gates to the younger generation's future. Indonesia started a national literacy movement in 2015 and replaced the national exam with a national assessment in 2021 that emphasizes literacy and numeracy (Permendikbudristek, 2021). NL is beneficial for solving practical problems in everyday life at home, at work, in society, and in Facing 21st-Century Challenges (Deda et al., 2023; Kemendikbud, 2017). In addition, numeracy literacy can be supported by using contexts that are close to the students (Johar et al., 2022). Traditional food *jagung bose* and *jagung katemak* , one of the local wisdom that is close to students' lives, needs to be used to bridge students to understand the concept of numeracy literacy in North Central Timor District (TTU). The local culture used in this study is the traditional food "*Jagung Bose*"(Deda & Maifa, 2021a, 2021b).

The fundamental problem with students in TTU is that LN is very low, students experience learning barriers (difficulties), only 31.45% (less than the national

percentage, 38.51%) of students answered correctly the number material, the low mastery of numbers is the reason for choosing the number concept in this study. The average score for the 2019 National Computer-Based Exam (UNBK) in mathematics at TTU was 38.61, far from the national average standard of 45.06 and decreased from 2018 and 2017 (Puspendik, 2019).

The average score of Indonesian students on the Program for International Student Assessment (PISA) decreased in 2018 to 379 from 386 in 2015 (OECD, 2017, 2019, 2021). One cause of the UNBK and PISA results is that teacher competency standards are still pedagogically oriented, less didactically oriented (Deda & Disnawati, 2024). Therefore, the didactical design of number concepts based on local wisdom is one of the solutions to overcome student learning barriers (Palpialy & Nurlaelah, 2015; Rahayu, 2020; Sidik et al., 2021b). Didactical design research on number concepts based on local culture emphasizes the reciprocal relationship between students and teaching materials, teachers and students, and teachers and materials according to didactical and pedagogical situations. To support the didactical case, pedagogical situation, and metapedadidactic situation (Rahayu, 2020; Suryadi, 2013), to boost TTU students' proficiency with numbers, it is essential to create a learning design situation based on local culture and number concepts. Therefore, this research aims to obtain an overview of the didactical situation in learning the concept of whole numbers as a basis for designing learning designs.

Some research results (Fitriani et al., 2020; Frananda Ayu Julianti, Nyiayu Fahriza Fuadiah, 2020; Palpialy & Nurlaelah, 2015; Sidik et al., 2021a; Sulistiawati, 2016; Sulistiawati et al., 2015) that have applied didactic design theory, students still experience learning obstacles, which can be seen from students' difficulties and errors. The advantages of didactic design research indicate that students are more independent with the didactic design of algebra teaching materials. Moreover, researchers from Europe, such as France, the Netherlands, Italy and Germany (Artigue et al., 2021; Blum et al., 2016; Tchoshanov, 2013; Zaoui Seghroucheni et al., 2014) emphasize the importance of didactic design research (DDR) as a theory of didactic situations in learning activities will underlie this research. Based on the aforementioned research, the purpose of this study, which is different from their research, is to investigate how the learning process passed by students related to the concept of number using local culture based on didactical situation theory for students in TTU.

METHOD

This research used qualitative approach to understand the phenomena that occur during the learning process of number concept material in one of Junior High School (SMP) in Timor Tengah Utara District and analyze it based on TDS. The sampling technique used in selecting this research sample is purposive sampling (Intan Indiati et al., 2021; Sidik et al., 2021a). The participants in this study were 27 students of one of the VII classes of junior high school consisting of 14 male students, 13 female students and one female mathematics teacher as a model teacher. This research followed the stages in DDR: prospective analysis, metapedadidactic analysis, and retrospective analysis (Deda & Disnawati, 2024; Jamilah et al., 2021; Suryadi et al., 2018).

The research consisted of three meetings with teachers: pre-observation, observation, and post-observation. While there were 3 meetings with students during class observations, respondent ability tests, and student interviews on the test results. The research instruments applied in this research were learning obstacle tests, observation sheets, interview guidelines, and documentation lists, including records of

interviews and discussions. Preliminary study data, as well as data collected both before and after the actual observations, were analysed. In this study, we will use Miles and Hubermen's method of data analysis (Muslimahayati & Wardani, 2019; Sugiyono, 2017; Syarmadi & Izzati, 2020), research data analysis through three flows: data reduction, data presentation and conclusion drawing.

RESULT AND DISCUSSION

Pre-Observation Stage (Prospective Analysis)

The researcher interviewed the teacher regarding the learning design that would be applied in the classroom and analyzed it, analyzed the model teacher's learning design, and compiled instruments based on the Hypothetical Learning Trajectory (HLT). The pre-observation interview was conducted with the teacher who taught Compulsory Mathematics grade VII on August 29, 2023, at 08.00. Based on the results of the pre-observation interview with the model teacher, it can be seen that in LT, the teacher understood the purpose of learning the concept of integer operations, not only to fulfil the curriculum demands but also to help students solve problems in everyday life. Jansen et al., (2016) mathematical skills function very importantly in everyday life and various professions. Although the teachers understood the learning objectives well, but students' learning readiness did not support this. Teachers argued that students' learning readiness was not technically and non-technically optimal. Technical learning readiness of learning regarding the tools used in learning did not yet support students optimally. At the same time, the lack of non-technical student learning readiness was seen in the study material's lack of student literacy.

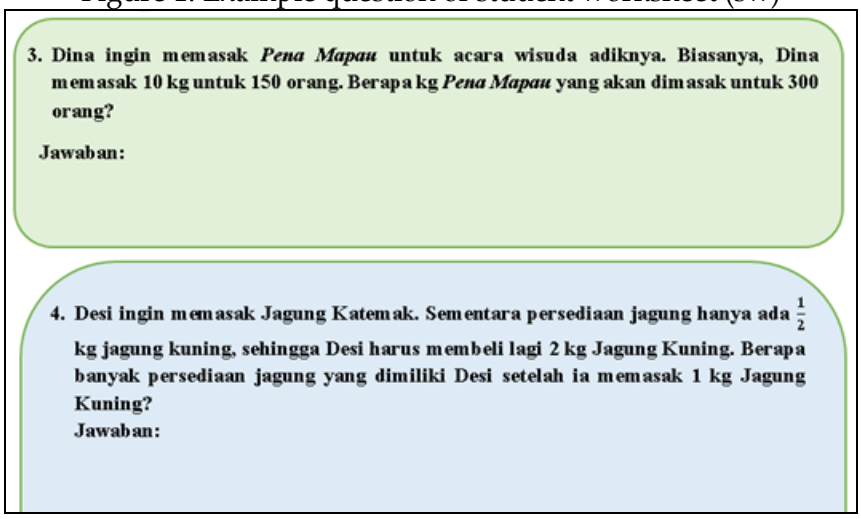
The teacher argued that to learn the concept of whole number operations well; students must understand the prerequisite materials, namely number recognition and simple addition, using various presentations such as words, tables, graphs, and diagrams learned in elementary school. Mathematical learning challenges are related with impairments in math skills, particularly arithmetic and problem solving, as well as difficulties with attentional disengagement (Cirino et al., 2015; Zhang et al., 2019). In addition to prerequisite materials, other components were used in learning, namely source books and other media. The thing that became the teacher's consideration in choosing the sourcebook was because of its availability in the library. When introducing the notion of whole number operations, teachers rarely considered whether the book they are using helps their pupils learn.

The learning flow chosen by the teacher starts by providing stimulus in the form of learning game paper slides related to whole number operations, then proceeds to discuss the concept of whole number operations. After that, students work together on problems on the worksheet, draw conclusions from the learning done, and then reflect on learning. Based on the learning flow described by the teacher, it can be seen that the teacher uses constructivism learning theory to provide a stimulus for students to experience cognitive conflict. Student's cognitive conflict will be resolved through self-regulation; in the end, students will build knowledge through interaction with their environment.

In designing this learning flow, the only consideration for teachers is the duration of learning, which is shorter than the usual learning hours. This consideration can potentially cause an ontogenic learning barrier because the learning flow is only concerned with the duration of material delivery without considering student readiness when learning takes place.

Based on the teacher's experience, implementing the learning flow in the classroom does not always run smoothly; there are always difficulties. Difficulties experienced by teachers and students can indicate the presence of LO that students may experience. The teacher can experience this difficulty; students can also experience it. Based on the interviews, teachers experience difficulties delivering less detailed material to students so that students understand the concept of whole number operations. This difficulty is caused by the background and condition of students during COVID-19, which is not optimal for math learning. In addition, the learning difficulties experienced by students seen by the teacher are that students do not understand the concept of integer operations, especially those related to daily applications in the form of story problems. To overcome the difficulties experienced, the teacher provides consultation and re-explains the material slowly so that students can understand the integer operation material. In addition, the teacher prepared a student worksheet based on traditional food as shown in Figure 1. The questions on the WS have met the numeracy literacy indicators based on expert validation.

Figure 1. Example question of student worksheet (sw)



Based on the existing LT and LO, the teacher follows the HLT that supports the needs of teachers and students during learning. The teacher chose the learning method of teams group tournament (TGT) to make students more active during the learning process. The TGT is a learning method that uses a group system of 3-5 students to help and motivate fellow group members to achieve learning objectives. However, the teacher's chosen learning method cannot be applied effectively in learning with a concise duration. The preparation of TGT materials took some time. The effectiveness of learning methods should be taken into consideration by teachers. In addition to learning methods, teachers make predictions of student responses and possible interactions that occur when learning takes place to support and facilitate learning. In addition, teachers also design assistance that students may need. The assistance provided by the teacher is situational, depending on the learning conditions. The TDS perspective suggests facilitating action, formulation, and validation in teaching and learning (Brousseau, 2002). The teacher's lesson plan needs to capitalise on this. When creating the learning flow, student learning preparedness and learning techniques may need to be noticed.

Observation Phase (Metapedadidactic Analysis)

At this stage, the researcher observes the learning of integer operation material. Researchers made observations by analyzing student responses that appeared during the learning process in real-time. In addition, researchers examined video recordings of learning that was only carried out in one meeting. The following is a discussion of the learning of the concept of integer operations carried out and the analysis carried out based on the perspective of the theory of didactical situation (TDS), learning obstacle (LO), learning trajectory (LT), and relevant learning theory. The analysis in this step also considers the unity, coherence, and flexibility factors in the teaching and learning process.

This learning observation was carried out in one learning meeting on October 12, 2023. The number of students who attended the lesson was 27 students. Learning is carried out directly and uses paper media. In addition, the teacher uses markers and a blackboard. The teacher and all the students were in class VIIB. The lesson started with a greeting, clapping the opening salutation and continued with checking the students' attendance. When checking students' attendance, the lesson duration is quite a lot. Then, the teacher informed that the material to be learned at that time was integer operation material. In the previous meeting, the teacher gave the students the material about integer operations. The lesson started by reviewing integer operations.

Table 1. Conversation between students and teacher

Teacher:	"Do you still remember the whole number material?"
Student:	"yes."
Teacher:	"Yes. Today's learning objective is to complete mixed operations of whole numbers: addition, subtraction, multiplication and division. Do you still remember Salju Beku?"
Student:	"I do."
Teacher:	"What is the result of -6+4?"
Student Cino:	"-2"
Teacher:	" Second question, -10+5?"
Student Arini:	"-5"
Teacher:	"Recall the concept of Salju Beku; what is Beku?
Student:	" Beku means different minus."

Based on the conversation Table 1 above, it can be seen that there is unity between the lesson plan and its actualization. During the interview, the teacher explained that students had been encouraged in the form of handbooks that could be obtained at the library. Then, the next session was a question and answer session. The teacher gave students time to express their opinions about whole number operations. After the students argued about their answers, the teacher validated them by asking other students about their previous answers. The congruence created between the plan and its actualization fulfils one of the metapedadidactic components, namely, the element of unity. Suryadi et al., (2018) argue that teachers should consider the unity aspect of the learning flow and various responses to avoid difficulties or obstacles that students may experience.

The teacher continues the learning by displaying the presentation of mixed operations of integers on the blackboard. Based on the video recording, it is known that the teacher wants to illustrate mixed operations in daily life so that students can understand diverse operations of whole numbers more easily. Furthermore, based on

the pre-observation interview conducted with the teacher, the teacher argued that she made predictions of students' responses. However, no interaction occurred between the teacher and the material, students and the material, or students and the teacher, when only one student answered the teacher's question about the lesson topic, and the other students tended to be silent. The interaction was due to the short duration of the lesson, so the teacher finally chose to continue the lesson by inviting students together to review the next material. Only a few students were enthusiastic about answering questions and reviewing the story problems in the TGT tournament. This lack of enthusiasm in learning whole number operations has the potential to cause students to experience psychological ontogenic barriers. This psychological ontogenic barrier is a learning barrier caused by students' lack of interest or motivation to participate in learning. After the teacher explained, the teacher tried to test the students with different questions, and the students managed to determine the result of the operation correctly. Brosseau argues that this condition can cause one of the complexities in TDS, namely the Topaze Effect (Wisdom, 2014). The cause of the Topaze Effect is the condition of students failing to answer the teacher's questions. The teacher asks more straightforward questions (probing) and continues to be more accessible so that the targeted knowledge disappears. The introduction of integers and simple integer operations is one of the prerequisite materials for the concept of mixed operations. This activity carried out by the teacher is an apperception activity. This apperception activity aims to attract students' interest, focus students' minds, and remind them of the material they have learned (Farina et al., 2022; Nurmasyitha & Hajrah, 2021). This apperception activity indirectly prepares students physically and psychologically to participate in learning, in line with the theory expressed by Thorndike, namely the law of readiness: students must be ready and in good condition physically and psychologically to succeed in learning. After that, the learning continued, introducing the ways and techniques of solving mixed operations of whole numbers. The initial explanation of the concept of mixed integer operations is as follows.

Table 2. Teacher explanation steps

Teacher:	The key to solving mixed operations of whole numbers.
Teacher:	"The key or the first requirement to solve mixed operations is to do the one in brackets first."
Teacher:	Parenthesized notation
Teacher:	Teacher: "It's either curly braces { } or regular brackets( )."
Teacher:	Order of operation sign.
Teacher:	"After the brackets are division or multiplication. Multiplication and division come first because they are stronger than addition and subtraction. Last is addition and subtraction. Remember the frozen snow."

Based on the explanation given by the teacher in the Table 2, some interesting findings exist. The first finding is when explaining the requirements of mixed operations of whole numbers. However, the teacher did not review the graph of integers' simple subtraction operations, has the potential to make students experience conceptual ontogenic learning barriers. The second finding is that the terms that mean whole number operations are not discussed. The third finding is that students are not allowed to ask questions after the teacher explains the concept of mixed integer operations. The third finding shows the lack of interaction between teachers and students, and the learning at school is one-way. At the same time, this part is

fundamental to the basic concept of mixed operations of integers delivered. Based on the interview with the teacher, this opportunity was not given due to the short duration of time while there was still a lot of material to be delivered. Finally, the teacher continued the lesson by giving examples of mixed integer operations. The example problem in question is as follows.

Example,

Solve 10 + (6-2):2 =...

Based on the first sample problem related to mixed operations of whole numbers. The teacher gives questions. When students work on this problem, the teacher does not assist students. Students seem to be able to answer well and correctly. The teacher confirms students' answers with other students' responses and then relates them to previously presented material. Based on TDS, the teacher facilitates students in the action, formulation, and validation processes. If these processes are include in learning, students would have a learning process.

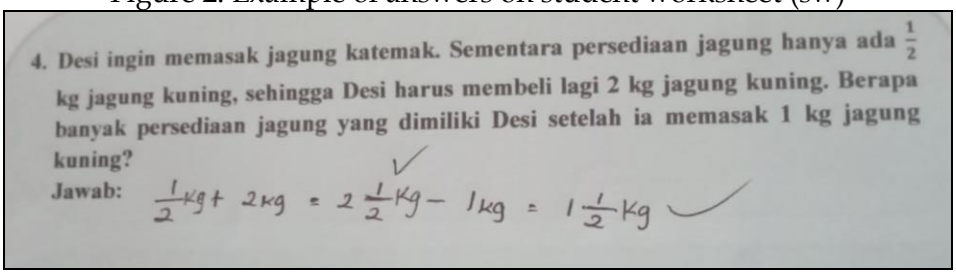
When the teacher explained the integer operation material based on tradisional food number 3 in Figure 1, all students seemed to pay close attention. Then, the teacher asked students what they got and understood. The transcript of the teacher and student conversation in the Table 3.

Table 3. Interaction between students and teacher

Student A:	"Dina wants to cook Pena Mapau for her sister's graduation ceremony. Usually, Dina cooks 10 kg for 150 people. How many kg of Pena Mapau will be cooked for 300 people?"
Teacher:	"Who can answer? Group one already, the other"
Student A:	"20 kg"
Teacher:	"Very good your answer"

Interaction between teachers and students on story problems that use the traditional food as local culture occurs relatively often. Several students answered the teacher's questions. After that, the learning ended. The teacher and students review what is known and ask from the story problem. Only most students respond to the teacher. The teacher has not asked students to conclude what they have learned from today's lesson.

Figure 2. Example of answers on student worksheet (sw)


4. Desi ingin memasak jagung katemak. Sementara persediaan jagung hanya ada $\frac{1}{2}$ kg jagung kuning, sehingga Desi harus membeli lagi 2 kg jagung kuning. Berapa banyak persediaan jagung yang dimiliki Desi setelah ia memasak 1 kg jagung kuning?

Jawab: $\frac{1}{2}kg + 2kg = 2\frac{1}{2}kg - 1kg = 1\frac{1}{2}kg$

Based on the results of the worksheet during the lesson in Figure 2, it can be seen that students respond well and feel helped by the worksheet that uses local wisdom of their traditional food as a context for learning whole number mathematics operations. Similar to students' answers to problem number 3 in Figure 1, the teacher confirmed students' answers to this SW problem number 4. The teacher asked about the answers

that students wrote on the SW, the teacher also asked about the reasons for these answers.

Post-Observation Stage (Retrospective Analysis)

At this stage, the researcher developed a didactical design for mixed operations of whole numbers and conducted a post-observation analysis of learning. What was done in this post-observation analysis included analyzing the results of the post-observation interviews.

Analysis of Post-Observation Interview Results

The research continued by interviewing the teacher after conducting learning observations and conducting student learning obstacle tests for 27 students of class VIIB. The purpose of this interview is to review the learning process that has been carried out and review the results of the respondent's ability test. The interview was conducted on October 12, 2023 at 08.30. Based on the findings of the teacher interview (post-observation), there are two interesting findings.

The first finding is that the interaction between teachers, students, and materials that should be able to run well in reality is constrained by students' readiness for learning. The curriculum used in learning the concept of mixed operations of whole numbers causes learning offline, face-to-face. The face to face learning aligns with government regulations stating that Indonesia is free from the COVID-19 pandemic. However, students still experience obstacles in the learning process. These obstacles have the potential to cause students to experience didactic learning barriers. This didactic learning barrier is one of the learning barriers caused by the curriculum, learning flow, and sourcebooks that do not facilitate students optimally.

The second finding obtained after interviewing the teacher is that the teacher believes that learning the concept of mixed operations of whole numbers is successful in terms of learning objectives achieved and learning that takes place according to plan. The teacher did not find delivering the mixed integer operation material difficult for students. Based on the applicable curriculum, the teacher also believes that the learning design used now needs to be revised. Next, from the learning that has done, the teacher argues that students have potential difficulties in understanding mixed operations of integers. At first, the teacher felt confident about achieving learning objectives in each material (Indahwati et al., 2023). Moreover, the learning carried out at school can facilitate students to understand mathematical concepts, especially in learning mixed operations of whole numbers. Local culture-based student worksheets are used in the classroom to promote learning situations. The learning situation is in line with the opinion of the teacher, who feels that he is satisfied with the learning that has been done and feels the need to continue to make improvements.

DISCUSSION

The results above show that before beginning a class, the instructor plans out the instructional strategy that will be used. This didactical design contains didactical situations that can facilitate teachers, students, and materials to interact with each other in the learning process. Mathematical didactics involves setting up situations in class that will force individual pupils to revise their understanding of key concepts (Brousseau, 2002). Didactic situations are also defined as situations where teachers and students actively interact while learning a mathematical concept (Brousseau, 2002; Novotná & Hošpesová, 2022; Selahattin Arslan, Demet Baran, 2011). Thus, the didactic situation is a design situation that contains interactions between teachers and students in learning to make students adapt to several mathematical knowledge references.

Brousseau suggests that the didactical situation cannot solve all problems in learning, but there is also a didactical situation (Brousseau; 2002). In principle, a didactical situation is a space created by the teacher to encourage the independence of a student's thinking ability individually and collectively (Suryadi et al., 2018). In addition, Brousseau argues that when the aualearning process takes place, students experience 4 ideal situations, namely action, formulation, validation, and institutionalization situations (Brousseau, 2002; Sakinah et al., 2019; Suryadi, 2013).

When the whole number operation concept is learned, an action situation occurs. Teachers create learning situations that encourage students to be able to interact with the environment by capitalizing on the knowledge that students have. At the beginning of learning, the teacher provides stimulation by recalling material related to integer operations. This activity aims to provoke students to recognize the concept of whole number operations based on their knowledge. At this stage, there is a process of storing new information or experiences and adding to what is already in their minds. Then, the teacher continues the learning process by providing apperception. Apperception activities play a role in captivating students' interest, focusing students' minds, recalling material that has been learned, and preparing students physically and mentally to take part in learning (Palupi et al., 2017). Apperception activities can encourage the development of students' knowledge schemes, because students will be better prepared to construct knowledge into their schemes (Al-Muwattho et al., 2018).
The formulation process occurs during the learning process of integer operation concepts. The teacher facilitates students to express their opinions and answers related to the teacher's questions that lead to the definition of whole number operations, notation, conditions, and how to determine the mixed operations of whole numbers given. The formulation process provides an opportunity for students to share, express, discuss, and present the arguments that have been compiled in the action process so that other students can listen and give consideration (Brousseau, 2002; Sulistiawati et al., 2015).

The researcher did not find a validation situation along with the learning process. When the learning process occurred, there were differences in student arguments related to problem solving but no process of verifying arguments and debates. The teacher immediately invites students to discuss the solution of the problem given by the teacher. According to Vygotsky, social interaction enhances cognitive development and encourages learning with peers or more experienced adults. Students will be more helped connecting ideas if they work with experienced teachers or knowledgeable colleagues. In an interview, the educator explained that the process was not carried out because of the little time allotted for learning; hence, she had to make the most of the time she had to teach the concepts underlying whole-number operations. The process does not align with the principles of TDS and meaningful learning theory that prioritize learning activities that can activate students (Polman et al., 2021; Vallori, 2014). The absence of a validation situation makes the institutionalization process impossible. Furthermore, meaningful learning that prioritizes student activeness through culture (Rosa & Orey, 2020). The meaningfull of TDS supported by worksheet students based on local culture as education source in Figure 1dan Figure 2.

The didactic situation supported by local culture created and the material mastered by the teacher can result in optimal learning. In addition, Brosseau argues that it is important for teachers to view the learning situation holistically as an object (Brousseau, 2002). For this to happen, teachers must have metapedadidactic skills. These metapedadidactic skills include three integrated components: unity, flexibility

and coherence (Fauzi & Didi Suryadi, 2020; Sidik et al., 2021a). The unity component is an overview component that links to the learning scenario, prediction of student responses, and anticipation of possible student responses (Putri et al., 2020; Sumita et al., 2022). Teachers think about the learning scenario in learning the whole number operations carried out offline. The researcher's interview with the teacher who produced an integer operation lesson plan for one meeting following the curriculum's suggestions shows scenario execution. In addition, the educator stated that the educator projected students' responses that might occur during the learning process. According to Suryadi, what teachers do in imagining potential implementations and anticipating student responses to didactical and pedagogical actions taken to modify didactical and pedagogical situations by students' abilities, needs, and learning speeds is crucial (Sidik et al., 2021a; Sulistiawati et al., 2015). Based on this description, the teacher's learning shows the unity component's existence. The unity component is the first major finding in this study. This unity component is supported by local culture-based student worksheets (Figure 1 and Figure 2).

The second component is the flexibility component, which creates adjustments to scenarios, predictions of student responses, and anticipations during the learning process according to reality (Arisetyawan et al., 2014; Suryadi et al., 2018). This flexibility component occurs based on the researcher's observation during the learning process. The teacher allows students to discover many things related to whole number operations. Students are allowed to discover the meaning of integer operations themselves. However, the teacher only gives a short duration for students to recognize and discover their knowledge. This sitution happens because math subjects are only given one hour in online learning. Therefore, the teacher must rush to deliver all the materials students must get at that meeting. Based on this description, it can be seen that there is a flexibility component in the learning process of whole number operations although it is less than optimal.

The third component is coherence or logical connection. This component relates to how all the scenarios, predictions and anticipations that develop during the learning process are organized so that situation changes occur smoothly throughout the learning process and lead to achieving goals. Although not perfect, the learning process shows some flexibility and achieves the goal so there is coherence. In addition to the integrated components, there is a complexity of didactical situations that may occur in the whole number operations learning process. During the lesson, the teacher provides material and questions related to the integer operation material. The teacher changes the question and gives an easier question if only one student answers it. This condition can trigger the Topaze Effect. When many students fail to answer the teacher's questions, the teacher asks easier questions (probing) and continues to be easier so that the targeted knowledge disappears (Wisdom, N., 2014). This probing has the potential to lose knowledge that should be targeted.When learning takes place, teachers and students discuss the answers to the examples of problems given by the teacher so that there is no debate and the teacher does not accept the wrong answer and also does not accept trivial answers from students as an authentic mathematics learning activity, so that the Jourdain Effect is unlikely to occur (Komala et al., 2021). In addition, no wrong analogies were found during the learning process. The use of analogies during the learning process was done when the teacher gave examples of story problems. Teachers give students examples of various story problems according to the concepts that teachers teach students. Then, there was no cognitive shift where the teacher suddenly changed the planned learning activity into a new learning

method. However, educators apply the same lesson plan for each class without considering differences in student abilities. In other words, this condition can be called the Aging of Teaching Situation.Didactical Design Research contributes to the design and improvement of teaching and learning arrangements, as well as theoretical contributions to understanding the teaching and learning process for whole number operations. Furthermore, didactical design research can improve pedagogical subject knowledge in mathematics by creating novel instructional resources that improve students' grasp of whole number operations.

One of the limitations of this research is that at the coherence stage, the teacher replaces the easier integer operation problems when many students do not respond. Whereas. learning integers has used "Salju Beku" and local culture of traditional food as learning resources. So, didactical situation can help students learn integer numbers more easily, but more research is needed to understand deeper concepts and predict student behaviors.

CONCLUSION

The results and discussion reveal that the teacher only provides an action situation, the formulation situation is not optimal, and no validation situation is seen. The teacher made a lesson plan for whole number operations and predicted students' responses that might appear during the lessonbaseod on local culture, showing unity. The flexibility component can also be seen in how the teacher lets students quickly discover and conceptualize whole number operations. In addition, the element of coherence can also be seen from the learning process, which shows the existence of the flexibility component even though it has not been maximized but still achieves the learning objectives. Researchers also found that there is a Topaze Effect and also Aging of Teaching Situation. Didactic Situation Theory can help students in North Central Timor to learn integers more easily. Consequently, the numeracy skills of junior high school students are improved. However, more research is needed to understand the deeper concepts and predict student behavior.

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AUTHOR CONTRIBUTION STATEMENT

Author Contributions, YND: Conceptualization, Drafting, Editing, and Method, HD: Editing, OD: Editing, S: Supervision, D: Supervision.

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