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## Developing the Ability to Add Integer through Live Worksheets among Grade II Pupils with Autism in Mathematics Learning

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### ABSTRACT

This paper presents a study using live worksheets to improve the capability of adding integer numbers in math subjects of pupils with autism. This study was classroom action research conducted in two cycles. The 1<sup>st</sup> cycle consists of 8 meetings and the 2<sup>nd</sup> cycle consists of 7 meetings, consisting of planning, action & observation, and reflection. The data used is qualitative which is analyzed using thematic analyses and quantitative which is analyzed using simple quantitative data analysis. The result of this research showed that the average student's initial abilities or score was 47.5. After being given intervention in the first cycle the score becomes 62. This improvement occurs in the aspect of understanding the steps for adding integers to a maximum of 10 but has not yet reached the final step so the addition result is not correct. After being given intervention in cycle II, the average score increased to 93. In cycle II, the students were able to calculate the addition of integers correctly to a maximum result of 10 by following the steps provided on the live worksheets. Based on this data, it can be stated that live worksheets can improve the ability to add integer numbers with a maximum result of 10 in the 2<sup>nd</sup> grade of pupils with autism in this school.

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## 1. INTRODUCTION

The subject of mathematics in the grade 2 curriculum is very important to study because if students do not understand integer addition, then they will have difficulty in multiplication. Furthermore, when students have difficulty understanding multiplication, they will also have difficulty dealing with division. Based on the description above, mathematics subjects are needed by students. Thus, they can understand each level of mathematics learning material.

The curriculum used at the school where this study was conducted is the Emancipated Curriculum based on the decision of the head of the standards, curriculum, and educational assessment body of the Ministry of Education, Culture, Research, and Technology regarding changes to the decision of the head of the standards, curriculum and assessment, research and technology body number 008/H/KR/2022 concerning learning outcomes in early childhood education, basic education levels, and secondary education levels in the emancipated curriculum. Mathematics learning for grade II special schools is referred to as Phase A in the emancipated curriculum. Mathematics subjects have four elements, namely number, measurement, geometry, and data and opportunity analysis elements. In the number element the learning achievement is that at the end of Phase A, students can show how to add natural numbers with a maximum result of 10 using concrete objects. So, the learning objective flow shows how to add real numbers with a maximum result of 10 using concrete or semi-concrete objects.

The low mathematics score in the addition of integer material is based on the test results given in the addition of integer questions. In mathematics learning so far, the learning media and methods used are counting using fingers and counting using concrete objects. The media and methods mentioned above cannot help students in solving integer addition problems, so students have difficulty understanding the material on adding integers. To understand the material in mathematics learning, appropriate learning media is needed for pupils with autism. Therefore, to understand mathematics, learning media in mathematics is needed that can help them think concretely towards abstract thinking. The difficulties faced by students in this study are: 1) Not being able to calculate the addition of integers with a maximum result of 10, 2) Not being able to understand the steps in doing the addition of integers, 3) guessing in calculating (in a hurry to finish quickly), 4) Angry with excessive emotions.

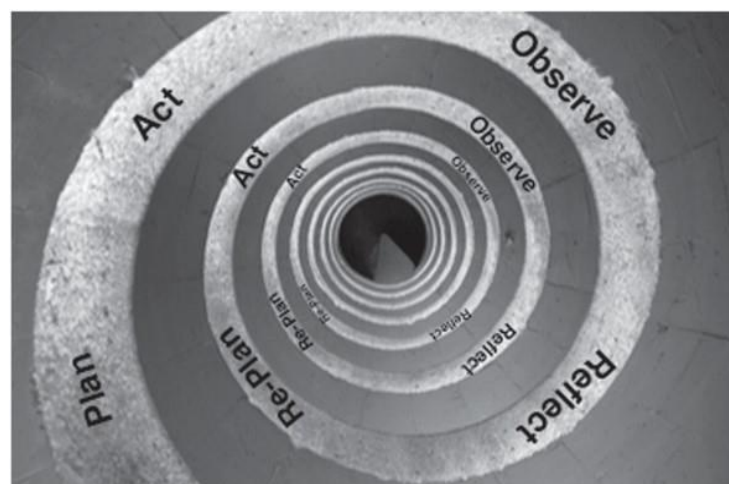
According to Biran and Nurhastuti (2018), the principles of learning for children with autism are as follows; 1). Structured; 2). Patterned; 3). Programmed; 4). Consistent; and 5). Continuous. Structured means starting from the easiest material after it has been mastered by students, the material will increase in level of difficulty but is a series that is not separate from the previous material. Patterned means activities carried out on a scheduled routine. Programmed means the material given must be gradual, while consistent means if the child behaves positively, the teacher will give a positive response (reward/reinforcement). The response given must be appropriate consistent, and continuous, meaning that learning will be repeated with the parents at home.

Live Worksheets is a free application that can be accessed on Google. This application can help teachers explain or provide an understanding of a learning concept and provide interactive practice questions. Live worksheets can help students understand the material of adding real numbers with a maximum result of 10. Through the right steps, namely: 1). Students read the questions; 2). Students move the image closer to the number; 3). Students move the number of pictures according to the numbers in the question; 4). Students count the images that have been moved; 5). Students fill in the sum results.

The reason researchers chose live worksheet to teach the addition of integers with a maximum result of 10 for students with autism is that the content displayed by live worksheet is in the form of images and is interactive (images can be moved) making it easier for students with autism to understand the material addition of integers. Learning activities for children with autism have their unique learning styles. The dominant learning style in autistic children is memorizing information as it is (rote learner), memorizing whole sentences (gestalt learner), and some even quickly understand information when given the help of pictures (visual learner). Based on the learning style of students with autism through visuals, live worksheet media is very appropriate to use in understanding the material of adding real numbers with a maximum result of 10.

## 2. METHOD

This research uses classroom action research, a method of research that takes steps carried out in cycles. The researcher determined the time required for each cycle of eight meetings and each face-to-face meeting was carried out for two class hours, where one class hour is 30 minutes. This was done based on the consideration that children with autism have difficulties in social interaction and communication as well as limited interests and repetitive behavior. Many repetitions are needed. Thus, they get used to and understand each stage or how to calculate the addition of real numbers. The more often you practice, the easier it will be for your child to solve real numbers of addition problems. **Figure 1** shows Kemmis & McTaggart's classroom action research cycle used in this study. Based on **Figure 1**, this research takes steps that are carried out cyclically and include stages; a) planning; b) action; c) observation; and d) reflection.



**Figure 1.** The spiral model of classroom action research.

The first stage is planning. At the planning stage, several activities were prepared to support the research, namely: 1) Determining the students who would be participants; 2) Conduct a pre-test; 3) Prepare a task analysis; 4) Develop instruments that will be used as assessment rubrics at the end of each meeting of each cycle; 5) Develop teaching modules; 6) Determine and decided the implementation time; 7) Make schedule for the activities to be carried out; 8) Compile student presence for each cycle; 9) Prepare live worksheet that will be used in learning mathematics about adding integers. The types of questions used for learning the mathematics of adding integers are drag-drop and joint arrow. Drag drop is dragging and releasing while the joint arrow is connecting. **Figure 2** shows an example of the learning material during the research process.

## Meeting 1

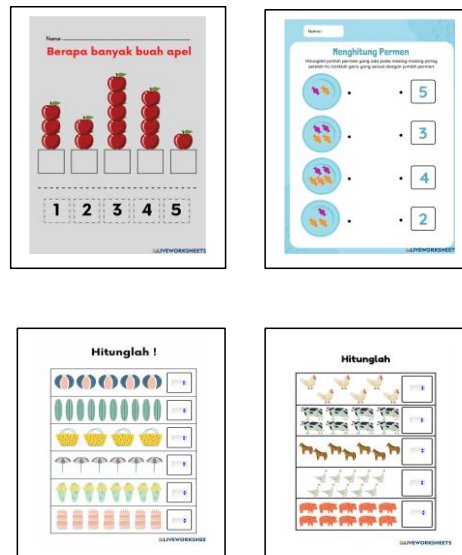


Figure 2. Example of teaching material.

The second stage is action and observation. At the action stage, the researcher and the observer carried out action/intervention. The intervention given from a complex task is divided into several simple steps which are called task analysis. To make it easier for students to work on adding real number problems using the help of live worksheet media. The live worksheet is used to help teachers explain the material and provide practice questions to students. The operation of adding integers uses the help of live worksheet media which uses the steps, namely: 1) read the question, 2) move the picture closer to the number, 3) move the number of pictures according to the number in the question, 4) count the pictures that have been moved, 5) fill in the addition results.

The third stage was observation in cycle I, which was carried out for four weeks, and was held twice a week, so the number of meetings for cycle I was eight. To improve and see the success of each cycle, observations, and evaluations are carried out during action activities. During the activity, researchers and observers observed the process of mathematics learning activities on the operation of adding integers using live worksheets and the student's abilities in mastering the material on the operation of adding integers. Apart from that, observers provide suggestions for making improvements to further activities that will be carried out.

The fourth stage is reflection. At this stage, activities are carried out: 1) Communicating the actions taken to the observer; 2) discussing according to plan, whether the learning plan is following the child's needs and looking at the child's shortcomings and progress; 3) Making conclusions that will be reached by each child to carry out revisions in cycle II.

The quantitative data as a result of the pre-test and post-test done by the pupils were analyzed using percentages. While the qualitative data as a result of teacher observation was analyzed thematically based on the steps to solve the integer addition problems (Widodo, 2014).

### 3. RESULTS AND DISCUSSION

#### 3.1. Results

Based on **Table 1**, the four students experienced an increase in their ability to calculate the addition of integers using the live worksheet. C experienced an increase in score from his initial ability. C was able to work on adding whole number problems only up to the third step, namely moving the number of pictures according to the numbers in the problem, with physical and verbal assistance. K experienced an increase in score from his initial ability and

could work on adding number problems up to step 4, namely calculating the images that have been moved with verbal assistance. L experienced an increase from the initial ability score and was able to work on the addition of whole numbers using live worksheet media up to step 4, namely counting pictures that had been moved with verbal assistance. B experienced an increase from the initial ability score and was able to work on the addition of numbers up to step 4, namely calculating the images that have been moved with verbal assistance. In cycle I, students were not able to complete the addition of integers using live worksheet media, specifically in steps 4 to 5, namely step 4: Calculates the images that have been moved and step 5: Fill in the sum results.

**Table 1.** Pre-test score and post-test cycle 1.

No	Participants	Pre-test score	Score after the first cycle
1.	C	30	52
2.	K	50	60
3.	L	60	68
4.	B	50	68
<b>Average</b>		47.5	62

The problems encountered by researchers and observers in cycle I were as follows:

- (i) Images used in live worksheet media as a tool for calculating provoke students to overreact, such as laughing out loud, thereby disrupting students' concentration
- (ii) There were only two devices used. Thus, other students who were not working were waiting by walking around which tended to disturb the concentration of students who were learning
- (iii) One student cannot use the mouse well, movement control is stiff. Thus, when moving the image, the student is discouraged and angry.

Based on these three encountered problems, teachers need to create good teaching and learning strategies to strengthen students' attention in lessons. From the results of the first cycle ability test, researchers and observers made several changes. Thus, students could concentrate better. **Table 2** shows the participants' score after cycles 1 and 2.

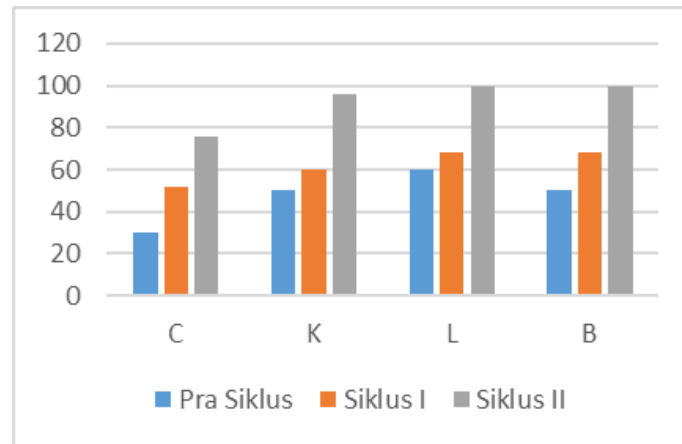
**Table 2.** Post-test score cycles 1 and 2.

No	Participants	Score after intervention in cycle I	Score after intervention in cycle II
1.	C	52	76
2.	K	60	96
3.	L	68	100
4.	B	68	100
<b>Average</b>		62	93

Based on the data in **Table 2** regarding scores of cycle I and cycle II, shows that there was an increase in the score of the ability to add whole numbers or integers in students in cycle II. C gets a score of 76. C can work on adding integer questions using live worksheet media starting from steps 1 to 5. K gets a score of 96 and can work on adding integer questions using live worksheet media up to the fifth step independently. L gets a score of 100 and can work on adding integer questions using live worksheet multimedia up to the fifth step independently. B gets a score of 100 and can work on adding integer questions using live worksheet media up to the fifth step independently. The increase in ability based on test results occurred because researchers and observers corrected the problems that occurred in cycle I, namely:

- (i) The image content used as a tool for calculating is replaced with an image of a circle, triangle, or block. It is hoped that it will not stimulate students to laugh and students can concentrate more.
- (ii) More devices are added as many as the number of students, it is hoped that all can concentrate during the learning process.
- (iii) The device that will be used by students who have difficulty using a mouse is replaced by a touch screen laptop.

Based on the overall data results, the average integer addition test score for pre-cycle ability was 47.5. These results indicate that the average ability of students is low. Therefore, the four students were given interventions that were assumed to make it easier for students to improve their ability to add whole numbers using live worksheet media (see **Figure 3**).



**Figure 3.** Comparison graph of participants' test results.

Based on **Figure 3**, there is an increase in the ability to add whole numbers in students with autism. The four students were given eight action meetings in cycle I, the average score produced in cycle I was 62. After being given intervention in cycle I the students were not able to complete the steps on how to solve the addition of integers using live worksheet media, the average student was able to complete up to the fourth step but is not yet independent, and still needs verbal assistance. It can be concluded that learning outcomes have not been achieved, but there has been an increase in initial abilities and cycle I, namely student C got a score of 30 on the initial ability test and increased to 52 in the cycle I test. Student K got a score of 50 in the initial ability test which increased to 60 in the first cycle test. Student L got a score of 60 on the initial ability test which increased to 68 in the first cycle test. Student B got a score of 50 on the initial ability test and increased to 68 on the cycle I test. In the second cycle test, improvement was again shown by all students. The four students were given seven action meetings in cycle II. Student C in cycle I got a score of 52, there was an increase in cycle II, and C got a score of 76. Student K in cycle I got a score of 60 and increased in cycle II with a score of 96. Learner L in cycle I got a score of 68 and increased in cycle II with a score of 100. Student B in cycle I got a score of 68 and increased in cycle II with a score of 100.

### 3.2. Discussion

This research is said to be successful if the participants can improve their ability to calculate the addition of integers correctly in the sense that students can work on adding integer problems using live worksheet media through five predetermined steps. In the first cycle, the four students experienced an improvement when compared with the test results before being given action, however, the students were not able to complete the steps that had been

determined. Thus, the final results in the calculation were not correct and the learning achievement was not as expected. Therefore, data analysis of the results of learning to add integers using live worksheet media is considered not optimal and will continue to cycle II.

In cycle II the researchers replaced the image content to suit the needs of the participants (grade 2 students with autism) this was following previous research by [Rhosyida et al. \(2021\)](#) that teachers can create their worksheets according to the material requirements to be created by combining various activity options and utilizing various resources. Resources in this case are not only material in text form but can also insert images. The results of the analysis in cycle II showed that three students had experienced an increase in their ability to calculate the addition of integers using live worksheet media independently through predetermined steps. The increase occurred because students felt happy and enthusiastic about working on adding whole number problems with a maximum result of 10 using live worksheet media. Students seem to be able to concentrate well when working on adding integers with a maximum result of 10 using live worksheet media. Thus, it can be concluded that using live worksheet media to improve the ability to add integers through predetermined steps is acceptable.

In this research, the live worksheet media shows the advantage that learning the addition of integers is easy to understand and fun because the learning is interactive. Thus, students are confident and able to work on questions independently and with verbal assistance in the form of instructions. It also can be done at home with the student's parents using the teacher's link to material for adding integers with a maximum result of 10 using live worksheets to relearn at home. Live worksheet media can be said to make things easier for teachers, students, and parents. This is following previous research written by [Sulistiani et al. \(2022\)](#). The advantage of this application is that it is good for students because it is interactive and motivating, for teachers this application saves time and saves paper. The use of an e-worksheet in the form of a live worksheet is expected to be an evaluation tool that follows the learning objectives to be achieved in the learning process based on teacher creativity and can foster student activity in working on questions with enthusiasm. The action given, namely the use of live worksheet media on adding whole number material based on the predetermined steps in doing it, can improve students' abilities in adding whole number material. This is following previous research by [Mahanani et al. \(2023\)](#) that the application of live worksheets to improve mathematics learning outcomes has increased, this is proven by the increase in the percentage of students who have achieved the minimum completeness criteria (KKM) before and after being given the action. Khikmiyah (2021) states that this Web Live worksheet can be an alternative that can be used by teachers to increase activeness and mathematical problem-solving abilities.

Based on the description above, it can be explained that teaching the addition of whole numbers with a maximum result of 10 using live worksheet media consists of the steps, namely reading the question, moving the picture closer to the number, moving the number of pictures according to the number in the question, counting the pictures that have been moved, and filling summation results. With regularity and the right steps, it can make it easier for students with autism to understand the material of adding whole numbers. This follows the characteristics of students with autism, where they like things that are sequential and orderly. The structur teaching is an important priority because it is more effective in following autistic culture than other techniques. Organizing the physical environment, developing schedules and work systems, using visual cues, and making expectations clear and explicit, help people with autism to develop skills and understanding.

#### 4. CONCLUSION

Based on the research results, there has been an increase in the ability to add real numbers or integers using live worksheets in grade 2 pupils with autism. This is evident from the reflection on the results of the initial ability test, cycle I, and cycle II. We used live worksheet media as a tool for learning the addition of integers with a maximum result of 10. The researcher created an image design using the Canva web which was then uploaded to <https://www.liveworksheets.com> after it was successfully uploaded, then selected the create worksheet feature by filling in the data. After creating the worksheet, the researcher entered the element editing feature. In this feature, there are many types of elements that can be used, but the researcher only used drag, drop, and single-choice elements. In learning to add integers using live worksheet media, students are asked to follow the steps, namely 1). Students read the questions; 2) Students move the image closer to the number; 3) Students move the pictures according to the number of numbers in the question; 4) Students count the images that have been moved; 4) Students choose answers to the questions. With structured, patterned, programmed, consistent, and continuous learning, autistic students can improve their ability to add whole numbers. From these results, live worksheet media can improve the ability to add integer numbers of grade 2 pupils with autism.

#### 5. ACKNOWLEDGMENT

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#### 6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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