MathCityMap Application in Mathematics Learning in Primary School

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Abstract
The background of this research is that the use of digital technology in learning mathematics in schools has not been optimal. The purpose of this research is to improve mathematics learning outcomes by utilizing technology through the MathCityMap application in teaching geometry in elementary schools. Methods This research uses classroom action research which is carried out in two cycles The subject was a population of 68 grade five students in an elementary school in West Java, using descriptive statistics. Data collection techniques using questionnaires, observations, tests, and, documentation studies. The results of this study indicate an increase in mathematics learning outcomes. In pre-cycle 58.05, it increased in cycle 1 to 72.03 and increased again in cycle 2 to 89.60. The results of observations show that the use of digital technology has the potential to support teachers in facilitating the teaching and learning process of mathematics outdoors so that students gain direct mathematical experience and deal with the real world. Based on these results, MathCityMap is proven to be able to improve mathematics learning outcomes for elementary school students, especially in teaching geometry.
Keywords*: learning outcomes, mathematics, mathcitymap*

Abstrak
Latar belakang dari penelitian ini adalah penggunaan teknologi digital dalam pembelajaran matematika di sekolah belum optimal. Tujuan penelitian ini adalah untuk meningkatkan hasil belajar matematika dengan memanfaatkan teknologi melalui aplikasi MathCityMap dalam pengajaran geometri di sekolah dasar. Metode Penelitian ini menggunakan penelitian tindakan kelas yang dilakukan dalam dua siklus. Subjeknya adalah populasi siswa kelas lima yang berjumlah 68 siswa di salah satu sekolah dasar di Jawa Barat dengan menggunakan statistik deskriptif. Teknik pengumpulan data menggunakan kuisioner, observasi, tes dan studi dokumentasi. Hasil penelitian ini menunjukkan peningkatan hasil belajar matematika. Pada pra siklus 58.05, meningkat pada siklus 1 menjadi 72.03 dan meningkat kembali pada siklus 2 menjadi 89.60. Hasil observasi menunjukkan penggunaan teknologi digital berpotensi mendukung guru dalam memfasilitasi proses belajar mengajar matematika di luar ruangan supaya siswa memperoleh pengalaman matematika langsung dan berhadapan dengan dunia nyata. Berdasarkan hasil tersebut, maka MathCityMap terbukti dapat meningkatkan hasil belajar matematika siswa sekolah dasar terutama dalam pengajaran geometri.
Kata Kunci: *hasil belajar, matematika, mathcitymap*

INTRODUCTION

Technology in the 21st century is growing rapidly, especially digital technology. Digital technology has entered various aspects of life, especially in the field of education as the main channel of change in the 21st century which gave birth to the concept of digitalization of education. Digitization of education is the utilization of technology as an aspect of the learning system, from the curriculum to the education administration system. The digitalization of education also has a huge influence on innovation in the world of education(Kementerian Pendidikan dan Kebudayaan, 2019). Equitable distribution of education in remote areas is helped by the digitization of education by utilizing the internet.

This is not positively correlated with the literacy, numeracy and science abilities of Indonesian students. The Organization for Economic Cooperation and Development (OECD) announced the results of the 2018 Program for International Student Assessment (PISA) According to data published by the OECD (OECD, 2019), from the 2009-2015 survey period, Indonesia consistently in the bottom 10. Of the three competency categories, Indonesia's score is always below the average. Likewise with the 2018 survey, Indonesia still places its students in the lowest ranks of literacy and numeracy measurements. Numeration is a person's ability to use numbers and mathematical symbols as well as basic mathematical concepts to solve a problem that occurs in everyday life (Khasanah & Putri, 2020).

Mathematics has a function in everyday life, both individual and social and work life (Cahyono, Adi Nur, 2017). However, both in school and in a wider scope, mathematics is sometimes considered a difficult and abstract subject that is easily lost. One of the reasons is that the presentation of problems that require solving are still abstract and detached from the real world. So that learning is needed related to the real world context that accommodates all the characteristics of the problem, one of which is learning outside the classroom. Learning outside the classroom is contextual learning. This learning builds intermediaries to create a realistic learning atmosphere and or close to students, so as to optimize the learning process and the achievement of learning objectives (Widada, 2015).

Of the several studies that have been conducted using this MCM application, none has been implemented in elementary schools. Even though the stage of child development at this time still has to be faced with things that are concrete operation and can be facilitated by technology (Herzamzam, 2018). Therefore researchers are interested in conducting research "MathCityMap Application in Mathematics Learning in Primary School" with the topic geometry.

Linking real-world contexts in learning can be done using an outdoor learning environment. Outdoor learning makes it possible to build mathematical knowledge through a constructivist perspective of psychology and social culture, it also helps students feel more connected to the world around them (Sugrah, 2020). Constructivism suggests that, in the learning process, learners should actively construct their own knowledge by relating new information obtained with prior knowledge, not just passively accepting perceptions or simply accepting information transferred from others (Miftahudin. Cahyono, 2018). The biggest impact of using outdoor learning is that learning is easier to remember and this makes it easier for students to build their knowledge more broadly. Outdoor learning allows students to discover the relationship between mathematics and other sciences and their application in the real world (Miftahudin. Cahyono, 2018).

Based on research conducted by Nugrawati (2019) Outdoor learning is one of the learning methods that uses the environment around the school, such as parks, gardens, fields, or other places that are expected to reduce student boredom. Outdoor learning also utilizes student interaction with an open environment as a learning resource. However, this research has not utilized technology in its implementation and is still traditional (paper based).

Utilization of the environment as a learning resource can be facilitated by the use of technology, especially cell phones. This is reinforced by research conducted by Adi Nur Cahyono and Miftahudin (Miftahudin. Cahyono, 2018) which shows that mathematics learning supported by the use of technology has encouraged students' involvement in mathematical activities. One of the learning activities that can accommodate the link between learning and the real world is the math trail contained in the MathCityMap application. This mathematics learning activity is a learning activity outside the classroom in order to explore and observe more deeply and solve real math problems in an outside environment that is equipped with exploration routes and simple maps to find mathematics(Hakim et al., 2019).

MathCityMap (MCM) is an android/iOS application based on GPS. MathCityMap (MCM) is a program that was first developed in Germany to improve students' literacy skills through the process of exploring interesting objects around schools, parks and anywhere in all corners of the city (Cahyono, Adi Nur, 2017). And now MathCityMap (MCM) Indonesia is being developed. MathCityMap (MCM) provides the location/finding of mathematical problems in the Math Trail which will serve as the starting point for a mathematical problem that will be solved by students.

Based on research conducted by Ludwig and Jesberg (Ludwig & Jesberg, 2015)MathCityMap is a program that was originally developed in Germany to improve students' literacy skills through the process of exploring interesting objects around schools, in parks, in corners of cities, and the surrounding environment. MathCityMap is a math learning that uses maps and the surrounding environment as a learning process. The learning takes place outside the classroom and students are given a map of where math problems can be found. When students find the place in question, students are required to solve the mathematical problems they find(Cahyono & Ludwig, 2019). Whereas in this study it discusses solving mathematical problems in elementary schools with concepts that are usually abstract in nature as outlined in real objects in the environment through technological assistance in the form of applications MathCityMap.

Efforts to make mathematics learning more fun and to improve students' overall understanding and have an impact on improving mathematics learning outcomes(Sidabutar, 2016), especially geometry material, researchers tried to apply outdoor learning methods based on digital technology using the MathCityMap application. The purpose of this study was to determine student learning outcomes using the MathCityMap application and student activities during outdoor learning. So it is hoped that in addition to adding insight, this research can be used as an effort to increase the use of digital learning in learning in elementary schools. As educational people, we can take advantage of digital technology as a positive learning medium.

METHOD

This research is classroom action research.The researcher uses the approach developed by Coast, namely classroom action research that departs from the problem, and is carried out in four stages, namely: (1) planning, (2) implementing action, (3) observation, and (4) reflection.(Mutaqin et al., 2021; Salimi et al., 2020; Sugiyono, 2019a).

This research was conducted in one of the elementary schools in Tasikmalaya City. Respondents in this study were 68 students of fifth grade, they are the population or the total number of fifth grade students at SDN Sukamulya who are sampled. The data collection techniques used in this study were (1) learning outcomes tests, (2) student activity observation sheets during outside learning, and (3) questionnaires/questionnaires. The questionnaires were distributed to all fifth graders of Tasikmalaya City Elementary School. Questionnaires were conducted to determine students' initial perceptions of mathematics. Observations were made to observe student activities in outdoor learning using the MathCityMap digital application. Question instruments to measure students' abilities related to mathematical problem abilities through the MathCityMap application. While documentation is done by collecting documents and data needed in research problems and research results.

The data analysis technique used is descriptive analysis (Sugiyono, 2019) with the stages of research procedures carried out in each cycle are as follows:

1. Stage per preparation; at this stage, the researcher conducts a theoretical study, sees the state of the environment and class, makes hypotheses, makes lesson plans, plans for outdoor learning arrangements, designs research instruments, validates instruments, and prepares research permits.
2. Implementation stage; at this stage, the researcher did it in two cycles. In the first cycle, the researcher gave instruments to students in the form of a questionnaire to determine students' perceptions of mathematics, and also conducted mathematics learning about geometry using the lecture method carried out in class. In the second cycle, the researchers re-applied mathematics learning with geometry material but by using a different method, namely *outdoor learning* based on the MathCityMap application.
3. Data analysis stage; The activities of outdoor learning students were observed and their learning outcomes were collected for analysis.
4. Conclusion drawing stage; at this stage, the researcher reviews what was done and the results achieved and then concluded by answering the problem formulation based on the research results according to the objectives.

RESULTS AND DISCUSSION

The success of student learning needs to be measured and evaluated as one of the references to assess the success or failure of learning programs including mathematics subjects with this Geometry material. So that it is expected that students can understand and apply knowledge better (Lotulung et al., 2018). Learning outcomes are a description of students' abilities in fulfilling a stage of achieving learning experiences in one basic competency that can be measured by tests(Nur yudha, 2017). Based on the data from the mathematics test results of geometry material before the application of outdoor learning using the MathCityMap application is 58.00.

To find out the cause of the low math scores on this geometry material, the researchers conducted a survey to students about their perceptions of mathematics. The erroneous perception of the majority of students towards math subjects so far has actually become the teacher's reflection material (Intisari, 2017; Digest, 2017).

Based on the results of research questionnaires from 68 students to explore information about perceptions of mathematics in table 1. the following.

Table 1. Students' Perceptions of Mathematics Subjects

No	Indicator	Statement	Score				
			HA	A	U	DA	HDA
1.	Receive or	I received the math subjects that the	14.8	70.4	11.1	3.7%	

	absorb	teacher gave me clearly and quickly.	%	%	%	
		The math lessons explained by the teacher, I received only a small part.	7.4%	29.6%	33.3%	25.9%	3.7%
		I received the mathematics lesson material clearly but it was easy to lose.	7.4%	40.7%	25.9%	22.2%	3.7%
		I understand mathematics in its entirety.	22.2%	51.9%	25.9%		
2	Understand or understand	I understand only part of the mathematics subject.	3.7%	44.4%	29.6%	18.5%	3.7%
		I do not understand mathematics in everyday application.		14.8%	44.4%	0.37	3.7%
		Mathematics subjects have nothing to do with other subjects.	3.7%	33.3%	0.37	25.9%	
		Math subject is very difficult.	3.7%	3.7%	25.9%	44.4%	22.2%
3.	Evaluate	Math subject is very scary.				44.4%	55.6%
		Maths is useless.		3.7%	0.37	29.6%	29.6%
		Math subjects cause stress (sadness).		18.5%	44.4%	22.2%	14.8%

Table 1. shows that most students agree that the subject matter received from the teacher is clear. However, as many as 40.7% of 68 students stated that the mathematics lesson was clearly accepted but easily lost. This indicates that the mathematics material is easily accepted when taking mathematics lessons, but then students are very easy to lose their mastery of understanding it.

Another indicator for the perception of mathematics subjects can be understood only partially as much as 44.4% of students agreed. This means that it can be concluded that the material presented by the teacher is not understood by almost half of the number of students. This can be caused by mathematics, because of abstraction mathematics and there is often a discrepancy in learning mathematics between different materials learned with the environment that students find in life everyday (Febriani Rotua Manullang, Miftha Indasari, 2020)

Implementation of Outdoor Learning using the MathCityMap application

The teacher chooses material that is still related to geometry. Based on the data obtained from learning outcomes that are still less than the Minimum Completeness Criteria (KKM), which is 75. Coupled with students' perceptions of mathematics which states that mathematics is easy to understand but easy to lose and only partially understood. Therefore, if this erroneous perception of students is not changed by the efforts of the mathematics teacher in providing subject matter that can be understood by all students and is not easily lost, then this kind of nuance will continue to grow and develop so that mathematics will remain a subject that is considered not to be important which results in low learning outcomes.

Therefore, the researcher views that a learning method is needed that is able to make students not easily lose their understanding. According to constructivism theory, "learning" is easier for humans to understand because humans build and develop knowledge based on experiences that have been passed (Cahyono & Ludwig, 2016) . For math learning abstract, students need tools in the form of media, as well as teaching aids so that the material provided by the teacher is more quickly understood and understood by student. And one of the media that can be used is through the application (Herzamzam, 2018). That researchers do utilize technology using the

MathCityMap application. This is also done as an effort to utilize digital technology as a learning medium, so that it can be positively beneficial and can educate and improve students' abilities, especially in learning mathematics more pleasantly.

First Cycle
1. Planning

This planning stage activity prepares a lesson plan including: environmental observations that will be used as learning resources, making Learning Implementation Plans, compiling assignments and math trails at Taman Kota Tasikmalaya through the MathCityMap application, and the assessment system which has been validated by the MathCityMap Indonesia team. Another preparation is the creation of data collection tools including: questionnaires, student worksheets both in documents and in the MathCityMap application, and observation sheets for student activities during outdoor learning.

2. Action Execution

In Cycle I, learning was carried out using the Outdoor Learning method based on the MathCityMap application, namely: grouping students, providing introductory material for the use of MathCityMap via cell phones, mentoring by teachers during outdoor learning, assignments by teachers through MathCityMap, group discussions, observations or observations during learning outdoors and posttest. Some of the activities in the implementation of cycle 1 can be seen in Figures 1 and 2.
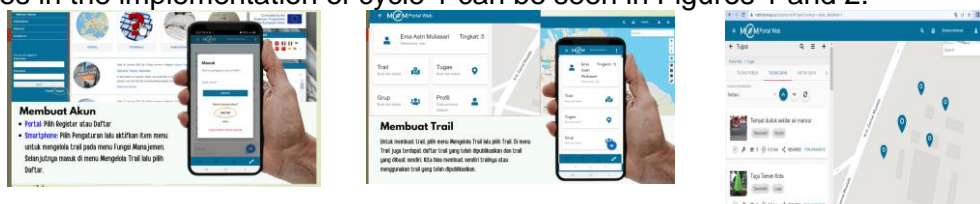

Figure 1. Creating tasks in the MathCityMap application

Figure 2. Introduction to the use of MathCityMap

3. Observation

Observation activities are carried out collaboratively with partner teachers as observers. The focus of observation is student activities and their interactions. Observations were made using a data collection tool in the form of an observation sheet on aspects of students' attitudes, knowledge and skills during outdoor learning using the MathCityMap application. The results of student observations during outdoor learning using MathCityMap can be seen in the figure 3.
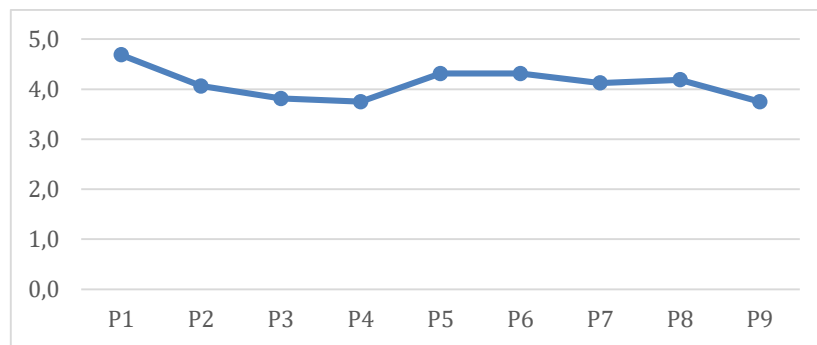
Very well scored 5;   Well scored   4; Enough   3; Not good   2; Not very good   1

Figure 3. Recap of Student Learning Observations Outdoors

Information:

P1 = Listening / paying attention to the explanation of the teacher or friend actively

P2= Read understand problem from MathCityMap app

P3=Solving problems/finding ways and answers to problems in the MathCityMap app

P4=Solving the problem of sketching or drawing real situations outside the classroom in the MathCityMap application

P5=Take measurements with the help of tools such as meters.

P6=Using a calculator

P7 = Expressing opinions to teachers and friends.

P8=Discuss, ask friends or teachers.

P9=Collecting a procedure or concept

From the observations, it turns out that the application of outdoor learning methods based on the MathCityMap application is able to make students' attitudes, especially indicators of listening to teacher explanations develop very well. Likewise with the skill aspect of the indicators of measuring with the help of a meter and the use of counting tools. For the aspect of knowledge, the indicators of reading and understanding problems in MathCityMap are good, but to solve problems/find ways and answers to problems in the MathCityMap application and solve problems with sketches or drawings of real situations outside the classroom in the MathCityMap application from observations, the results are still lacking.

4. Reflection Stage

Based on observations, it turns out that the act of learning mathematics with the application of outdoor learning methods based on the MathCityMap application is able to make students' attitudes and skills develop well, but they still have to improve in terms of solving problems and finding ways and answers to problems that still need to be improved. Students are not used to pouring problems or questions in the MathCityMap application into the real-world context. Likewise, learning outcomes even though they have increased from the pre-cycle but still do not

Second Cycle

The proof of the hypothesis in the second cycle is more about testing the consistency of the results of the hypothesis test in the first cycle. In the first cycle, the action hypothesis which states that the use of technology in mathematics learning with geometry material carried out outdoors based on MathCityMap can improve student learning outcomes, attitudes and performance, especially in the aspect of listening to teacher explanations, the use of counting aids and meters is acceptable. To test the reliability of the findings in the first cycle, the action will be tested again for its consistency in the second cycle.

1. Planning

This planning stage activity prepares a lesson plan including: making a Learning Implementation Plan, trail in the form of assignments through the MathCityMap application, and the MathCityMap assessment system.

2. Action Execution

In Cycle II, outdoor learning based on the MathCityMap application was carried out, namely: grouping students, mentoring by teachers during outdoor learning, assignments by teachers through MathCityMap and worksheets, group discussions, observations or observations during outdoor learning and posttests. Some of the activities in the implementation of cycle II can be seen in the figure 4.

Figure 4. Implementation of outdoor learning

3. Observation

Observation activities are carried out collaboratively with partner teachers as observers. The focus of observation is student activities and their interactions. Observations were made using a data collection tool in the form of an observation sheet on aspects of students' attitudes, knowledge and skills during outdoor learning using the MathCityMap application.

Student learning outcomes in the second cycle obtained results of 89.60. This is of course an increase from the previous which only reached 72.03. This average has also reached the KKM score. For the results of observing student attitudes and performance during outdoor learning based on the MathCityMap application, all aspects of each indicator show a very good and good level.

4. Reflection Stage

Based on observations, it turns out that with the use of digital technology in outdoor mathematics learning based on the MathCityMap application, students' attitudes and performance have increased, followed by an increase in student learning outcomes. This is evidenced by the increase in the average learning outcomes of fifth grade elementary school students in Tasikmalaya City from pre-cycle, first cycle and second cycle, namely 58.05; 72.03 and 89.60.

Math trail is a characteristic of outdoor learning that uses problems in real-world situations. Research by Cahyono & Miftahudin (2018) shows that the MathCityMap application is able to support math trail activities by involving students to study directly outside the room. The MathCityMap Portal has presented authentic problems related to the real world. So that math trail activities with the help of the MathCityMap mobile application are expected to be able to improve mathematical problem-solving skills which in turn will improve student learning outcomes.

So far, mathematics learning takes place conventionally with the lecture method. Of course this is very influential on students' mathematics learning outcomes. In carrying out mathematics learning should pay attention to the psychological development factors of students, so that students can carry out the process of solving mathematical problems appropriately. Contextual learning processes that involve students' cognitive conflicts are able to achieve the ability to understand concepts (learning outcomes) and students' problem solving well (Widada et al., 2019) .

Based on the data description and data analysis that has been described previously, it can be described the profile of learning outcomes before the application of the outdoor learning method based on the MathCityMap application and after its application in figure 5.
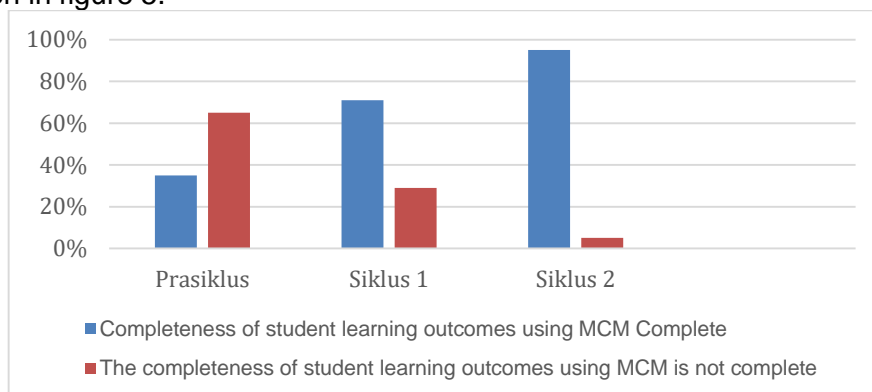
Figure 5. Completeness of Student Learning Outcomes through MathCityMap

The figure provides information that the mastery of mathematics learning outcomes from pre-cycle to cycle II has increased by 31.60 points or by 60%, meaning that student achievement or learning outcomes have an increasing trend.. With this method, students can learn through direct experience and make it easier for students to understand lessons in the long term, so that student learning outcomes can be higher.
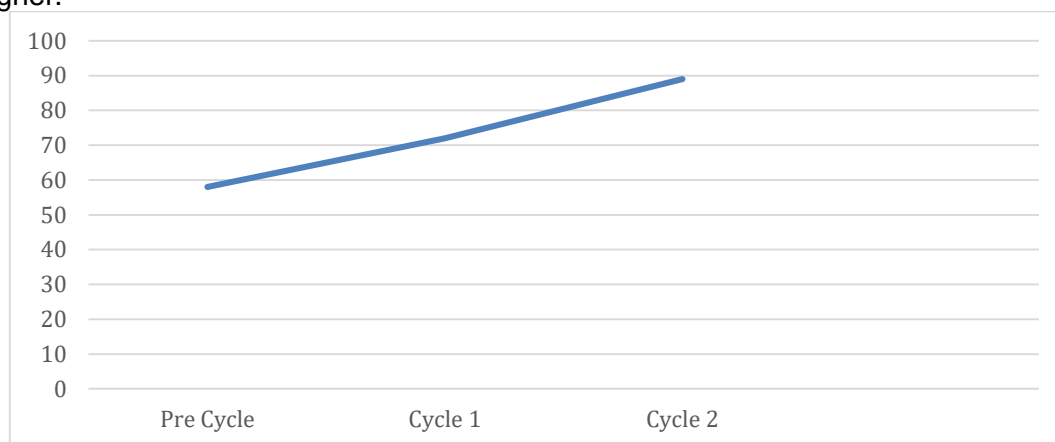
Figure 6. grades average value in pre-cycle, cycle 1 and 2

The diagram provides information that the average value obtained in the pre-cycle is 58.05; in cycle 1 sesbar 72.03; in cycle 2 of 89.60. This is in line with Muhasim research (2017), the use of digital technology as a learning tool has a positive effect on the emergence of student learning motivation so that it is expected that student learning achievement can be achieved optimally.

Based on the discussion of the research results, the hypothesis that the use of digital technology in outdoor learning based on the MathCityMap application can improve student learning outcomes in mathematics subjects with empirically proven or acceptable geometry material.

CONCLUSION

Based on the results of the research and discussion in this study, it can be concluded that before the improvement, students in understanding mathematics material, especially geometry, were lost more quickly. Meanwhile, after using the MatchCityMap application, there was an increase in learning outcomes and students'

perceptions of learning mathematics to be more fun and not quickly lost. In cycle, it showed an increase in student learning outcomes when compared to the previous results. This can be seen from the ability of students in learning amounted to 48 people 71% with an average value of 72.03. In Cycle 2, in this cycle the increase in student learning outcomes in participating in learning has reached 65 people, namely 95% with an average value of 89.60.

Outdoor mathematics learning based on the MathCityMap application can improve student learning outcomes, especially geometry material, so further research and other teachers are advised to use this method for other sub-materials and develop trails according to their environment. During outdoor learning using a cell phone that contains the MathCityMap application, the teacher must be more careful in supervising the course of student learning so that they are careful and thorough.So, From this research it is hoped that the mathCitymap application can be developed and used for improve learning math is suggested in order to be able to maximally utilized Teacher this is in line with research conducted by (Rosida et al., 2019) that the use of digital technology affects problem solving abilities student math.

REFERENCES

Cahyono, A. N., & Ludwig, M. (2016). *13th International Congress on Mathematical Education Hamburg , 24-31 July 2016 MATHCITYMAP : EXPLORING MATHEMATICS AROUND THE CITY. July*, 24–31.

Cahyono, A. N., & Ludwig, M. (2019). Teaching and learning mathematics around the city supported by the use of digital technology. *Eurasia Journal of Mathematics, Science and Technology Education*, *15*(1), 1–8. https://doi.org/10.29333/ejmste/99514

Cahyono, A. N.; Miftahudin. (2018a). Mobile technology in a mathematics trail program: how does it works? *Unnes Journal of Mathematics Education*, *7*(1), 24–30. https://doi.org/10.15294/ujme.v7i1.21955

Cahyono, A. N.; Miftahudin. (2018b). Mobile technology in a mathematics trail program: how does it works? *Unnes Journal of Mathematics Education*, *7*(1), 24–30. https://doi.org/10.15294/ujme.v7i1.21955

Cahyono, Adi Nur. (2017a). MathCityMap : Motivating students to engage in mathematics through a mobile app-supported math trail program. *Research on Outdoor STEM Education in the Digital Age. Proceedings of the ROSETA Online Conference in June 2020*, 155–158.

Cahyono, Adi Nur. (2017b). MathCityMap : Motivating students to engage in mathematics through a mobile app-supported math trail program. *Research on Outdoor STEM Education in the Digital Age. Proceedings of the ROSETA Online Conference in June 2020*, 155–158.

Febriani Rotua Manullang, Miftha Indasari, P. Y. (2020). Development Of Mathematics Ajar Materials Based On Etopapa (Ethnomathematics In Tourism Objects Of Palembang City). *DWIJA CENDEKIA: Jurnal Riset Pedagogik*, *4*(1), 114–124.

Hakim, A. R., Asikin, M., & Cahyono, A. N. (2019). Aktifitas Math Trail Berbantuan Aplikasi Mobile untuk Meningkatkan Kemampuan Pemecahan Masalah Matematika. *Prosiding Seminar Nasional Pascasarjana (PROSNAMPAS)*, *2*(1), 109–114.

Herzamzam, D. A. (2018). the Effectiveness of Educational Games in Math Learning in Elementary School. *DWIJA CENDEKIA: Jurnal Riset Pedagogik*, *2*(2), 21. https://doi.org/10.20961/jdc.v2i2.26274

Intisari. (2017). Persepsi Siswa Terhadap Mata Pelajaran Matematika. *Jurnal Pendidikan Pascasarjana Magister PAI*, *1*(1), 62–71.

Kementerian Pendidikan dan Kebudayaan. (2019). Digitalisasi Sekolah Mendayung Generasi Indonesia Maju. Jakarta: Kementrian Pendidikan dan Kebudayaan. *XXXIX/Oktober*, 1–36.

Khasanah, M., & Putri, A. M. (2020). *Universitas muhammadiyah kotabumi. 1052*, 22287.

Lotulung, C. F., Ibrahim, N., & Tumurang, H. (2018). Effectiveness of learning method Contextual Teaching Learning (CTL) for increasing learning outcomes of entrepreneurship education. *The Turkish Online Journal of Educational Technology - TOJET*, *17*(3), 37–46.

Ludwig, M., & Jesberg, J. (2015). Using Mobile Technology to Provide Outdoor Modelling Tasks - The MathCityMap-Project. *Procedia - Social and Behavioral Sciences*, *191*(June 2015), 2776–2781. https://doi.org/10.1016/j.sbspro.2015.04.517

Muhasim, M. (2017). Pengaruh Tehnologi Digital terhadap Motivasi Belajar Peserta Didik. *Palapa*, *5*(2), 53–77. https://doi.org/10.36088/palapa.v5i2.46

Mutaqin, E. J., Salimi, M., Asyari, L., & Hamdani, N. A. (2021). Realistic mathematics education approach on teaching geometry in primary schools: Collaborative action research. *Journal of Physics: Conference Series*, *1987*(1), 12031. https://doi.org/10.1088/1742-6596/1987/1/012031

Nugrawati, Y., Ahmad, H., & Samad, I. (2019). Outdoor Study Terhadap Hasil Belajar Matematika Pada Materi Statistika. *Journal Peqguruang: Conference Series*, *1*(September), 2686–3472.

Nur yudha, A. (2017). Peningkatan Hasil Belajar Matematika Melalui Discovery Learning Berbantuan Talking Stick Siswa Kelas 2. *Jurnal Handayani*, *7*(2), 149–159.

OECD. (2019). *PISA 2018 results in focus*.

Rosida, E. N., Kurniati, L., & Kusumawati, R. (2019). Analisis Pemecahan Masalah Matematika Berdasarkan Pemanfaatan Teknologi Digital Siswa. *Square: Journal of Mathematics and Mathematics Education*, *1*(1), 33. https://doi.org/10.21580/square.v1i1.4089

Salimi, M., Suhartono, S., Hidayah, R., & Fajari, L. E. W. (2020). Improving mathematics learning of geometry through the concrete-pictorial-abstract (CPA) approach: collaborative action research. *Journal of Physics: Conference Series*, *1663*, 12046. https://doi.org/10.1088/1742-6596/1663/1/012046

Sidabutar, R. (2016). The Efforts to Improve Mathematics Learning Achievement Results of High School Students as Required by Competency- Based Curriculum and Lesson Level-Based Curriculum. *Journal of Education and Practice*, *7*(15), 10–15.

Sugiyono. (2019b). *Metode Penelitian Pendidikan (Kuantitatif, Kualitatif, Kombinasi, R&D, dan Penelitian Pendidikan)*. Bandung:Alfabeta.

Sugrah, N. U. (2020). Implementasi teori belajar konstruktivisme dalam pembelajaran sains. *Humanika*, *19*(2), 121–138. https://doi.org/10.21831/hum.v19i2.29274

Widada, W. (2015). Proses Pencapaian Konsep Matematika dengan Memanfaatkan Media Pembelajaran Kontekstual. *Jurnal Penelitian Pendidikan Matematika Dan Sains*, *22*(1), 31–44.

Widada, W., Herawaty, D., Anggoro, A. F. D., Yudha, A., & Hayati, M. K. (2019). *Ethnomathematics and Outdoor Learning to Improve Problem Solving Ability*. *295*(ICETeP 2018), 13–16. https://doi.org/10.2991/icetep-18.2019.4