Vol. 8., No. 3, December 2024, pp. 193-207 ISSN 1978-0524 (print) | 2528-6374 (online)

Teachers' understanding of computational thinking unplugged implementation in the merdeka curriculum in the education services of Majalengka District

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Received 23 February 2024; accepted 19 December 2024; published 19 December 2024

ABSTRACT

This activity aims to provide an understanding to teachers who are engaged in seeking to enhance the competence of teachers in conducting merdeka curriculum, improving critical thinking skills, and problem-solving using Computational Thinking with unplugged learning. Computational Thinking becomes the learning needed in 21st century education in an independent curriculum and one of the skills that needs to be integrated into education. Teachers, as the main pillar of education, play an important role in the mastery of Computational Thinking in pupils. Based on discussions with some teachers at Majalengka, the teachers still do not understand the concept and application of Computational Thinking in learning. Computational Thinking can be taught and trained without using a computer commonly known as unplugged learning. This activity uses the Community-Based Participatory Research (CBPR) methodology in which Teachers and Students of the Computer Science Studies Program collaborate with the Majalengka District Education Service to contribute to providing service learning to teachers at all levels of education to implement Computational Thinking learning with unplugged learning in their respective schools. The results showed that 54.8% of teachers understood and mastered Computational Thinking with unplugged methods, 78.6% of the teachers considered unplugged methods important to support the learning process.

KEYWORDS
Community-based participatory research
Computational thinking
Merdeka curriculum
Teacher understanding
Unplugged learning

1. Introduction

Education is one of the main foundations in a country's development efforts. To improve the quality of education, changes in the education curriculum are a very significant step. In Indonesia, the Merdeka Curriculum Concept has been introduced to give schools and teachers more freedom in designing a curriculum that suits local needs and conditions, having the authority to choose various teaching aids, so that the learning process can be tailored to students' learning needs and interests [1]–[3]. One aspect that emerges in this context is the application of Computational Thinking in learning, which allows students to develop computational thinking skills that are highly relevant in an increasingly digitized world [4], [5].

An important and interesting competency for computer educators is computational thinking because it is related to critical thinking and problem solving [6]–[8]. As an important area, computational thinking is included in the skill set of 21st century competencies that have been recognized as important in various areas of study [9]. This conclusion is justified because computational thinking is used in the context of analyzing and designing solutions to problems, and is also understood as a systematic approach to solving complex problems and developing the steps of a solution to a problem.

In recent years, the concept of Computational Thinking has been popular as computer science becomes a multidisciplinary field and teaching programming becomes a required learning in 21st century

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education [10]. Computational Thinking is a cognitive process involving logical reasoning where problem solving is outlined and further understanding of the artifacts, procedures, and systems involved [11], [12]. Computational Thinking is essentially about problem solving using concepts and strategies most closely associated with computer science. Problem formulation should be considered an important part of this problem-solving process. Since the formulation of solutions to problems using Computational Thinking does not necessarily involve computers, although the execution of solutions usually uses computers, Computational Thinking can be taught without the use of computers [13], [14].

According to the Horizon Report (The NMC/CoSN Horizon Report: 2017 K-12 Edition, 2019), Computational Thinking is one of the six skills that should be integrated into education. Integrating Computational Thinking into activities, lessons and curriculum is not only to facilitate the development of new skills, but also to enhance the learning process and engagement in various fields of study [10].

Teachers as the main pillar of education play an important role in mastering computational thinking in students. However, based on discussions with several teachers in Majalengka, the teachers still do not understand the concept and application of computational thinking in learning. Computational thinking skills can encourage a person to use computing without having to use a computer, so that it can integrate problem solving skills with other fields of study and introduce broader computer science concepts. Forming students to think like a computational thinker in every problem solving, through six characteristics, namely being able to explain, interpret, apply, realize the existence of various perspectives, empathize and have self-knowledge. Examples of reflection of educators' understanding of computational thinking [15]–[17] start from explaining, interpreting, applying, seeing with perspective, empathizing and building self-knowledge. After understanding the context of computational thinking, the realization will come naturally that the thinking process needs a framework that can become a habit when facing, but the challenge on the teaching side is how to organize and teach gradually and deeply rooted into a habit of daily thinking patterns.

In the Merdeka Curriculum, based on the decision letter of the Head of the Education Curriculum and Assessment Standards Agency Number 033_H_KR_2022 concerning Learning Outcomes, Computational Thinking is a basic element for Informatics subjects in particular. It is also necessary regarding Computational Thinking in other subjects so as to obtain learning effectiveness and efficiency. Elements of computational thinking are described as tiered problem solving skills through modeling, simulation to produce effective, efficient and optimal solutions that can be executed by humans or machines including logical, critical and creative reasoning based on data, both independently and collaboratively. In inclusive subjects such as Informatics in the Merdeka Curriculum, learning outcomes are arranged in stages from phase A to phase E. In phase A, learners are expected to apply Computational Thinking in solving daily challenges and problems, while producing solutions in solving daily challenges and problems containing small-volume data sets is an achievement for phase B. After that, in phase C, learners are expected to be able to produce various solutions in solving daily problems containing larger-volume data sets resulting from the abstraction of tangible objects using various methods by utilizing the equipment provided. After that, in phase C, learners are expected to be able to generate a variety of solutions in solving everyday problems containing data sets with larger volumes resulting from the abstraction of tangible objects using various methods by utilizing the equipment provided while understanding the concept of data processing worksheets and applying computational thinking in solving problems containing simple structured data sets with small volumes, is an achievement for phase D.

Learning outcomes in phase E, increase in the area of understanding the validity of data sources, understanding the concept of data structures and standard algorithms, applying computational processes carried out by humans independently or in groups. In the last phase, phase F, learners are expected to understand the flow of the process of developing digital technology programs or products, writing efficient, effective, and optimal algorithms, analyzing problems with their understanding of several algorithmic strategies to produce several alternative solutions to one problem.

The results of a survey conducted to several school teachers in the Majalengka Education Office gave the results that the availability of computer facilities for learning activities teachers assessed 11.9% less good, 26.3% quite good, although there was a teacher assessment of 45.2% good and 16.7% very good. Based on these data, there are still computer facilities and infrastructure in schools that need to be improved for learning needs. This is a problem in the learning process. In learning Computational Thinking is actually closely related to computers and programming, but computational thinking can be

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taught and trained without using computers [18]. The learning method is commonly known as unplugged learning.

Unplugged learning is learning designed to teach computational thinking skills, computational concepts, procedures, and processes without using any digital technology [19]. Learning is done using simple items such as pencils and paper, coloring activities, puzzles, and card games [20]. Computational Thinking Unplugged is a method of teaching information science without using computers. Computational Thinking Unplugged teaches the basic principles of more complex computational thinking. The main principle of unplugged is to develop a Computational Thinking teaching method that does not rely on computers [21].

Based on this background, the Department of Computer Science Education, Universitas Pendidikan Indonesia organized workshops and seminars as well as monitoring of merdeka curriculum learning for elementary, junior high, and high school / vocational school teachers to implement Computational Thinking through unplugged activities in learning. This activity aims to provide understanding to teachers in implementing Computational Thinking with unplugged learning which is carried out to strive to improve teacher competence in improving students' critical thinking and problem solving skills.

2. Method

Based on the background and problems described, the materials and methods used in this activity are described as follows.

2.1. Tools and Materials

This activity uses tools in the form of smartphones to organize whatsapp groups with participants, as well as laptops and projectors used to display materials during training activities. The materials used include power point slides, unplugged-based lesson plan worksheets, and questionnaires in the form of Google Forms distributed through the whatsapp group.

2.2. Activity Implementation Method

The methodology carried out in this activity uses the Community Based Research (CBR) methodology or also known as Community Based Participatory Research (CBPR). CBR or CBPR is research that is carried out with a pattern of collaboration between the community and the world of higher education that is action-oriented with service learning to support social movements for the realization of social justice. This methodology involves students and lecturers working together with community organizations (communities) in a research activity to achieve common goals. The purpose of CBR is to answer research problems and real problems faced by the community; meeting the needs of the community [22]. In the end, CBR offers a solution or contribution to problems or needs in the community. In this case, Lecturers and Students of the Computer Science Study Program collaborated with the Majalengka Regency Education Office to jointly contribute to providing service learning to teachers at all levels of education to become contributors to the PANDAI (Pengajar untuk Era Digital Indonesia) movement to implement Computational Thinking learning which is a 21st century learning need in each school. In this research, the stages of research were carried out as depicted in Fig. 1.

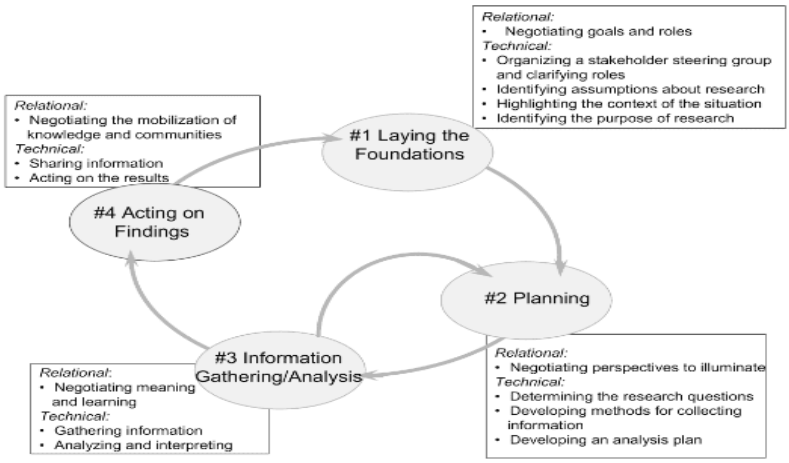

Fig. 1. Community-based research (CBR) methodology for community service [22]

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The explanation of the steps to carry out this activity is as follows:

- Building Basic Principles & Concepts of Research
  In the 1st stage, several activities will be carried out, namely:
  - Organizing stakeholders and teams, in this activity a team will be formed that will be involved during the preparation activities and this activity involving lecturers, students, and partners who will work together.
  - Planning the initiation related to the research that will be made by identifying and reviewing the gap in teaching implementation and educational needs in the 21st century, identifying research objectives and research goals/targets.
- Research Planning
  In the 2nd stage, several activities will be carried out, namely:
  - Determining the research problem, this activity is carried out after conducting teaching implementation review activities in the previous stage.
  - Determining methods for collecting information and data. In this activity, the initial plan or stages that need to be carried out to obtain information and data in accordance with the research objectives that have been compiled will be prepared.
- Data & Information Collection and Analysis
  In the 3rd stage, several activities will be carried out, namely:
  - Collecting data and information. To obtain data and information for research needs, observations will be made to the research site and interviews will be conducted with stakeholders at the Majalengka Regency Education Office.
  - Analyzing and interpreting the data and information obtained as material for planning the activities that will be prepared.
- Action on findings
  This stage is the core stage of the service activity. At this stage, several activities will be carried out to the research target by conducting service learning in the form of workshops for teachers in Majalengka Regency. The activities that will be carried out are as follows:
  - Planning the schedule of activities to be carried out in Majalengka Regency
  - Preparing the needs required during activities such as learning materials, logistics, and resources.
  - Implementation of service activities in the form of workshops and seminars, this activity is the core activity of this research. The workshop will be held offline twice. The first workshop will focus on the introduction of unplugged activities and the second workshop will focus on making lesson plans by implementing unplugged activities.
  - Implementation of activity evaluation, this activity is carried out to review all activities that have been carried out

2.3. Location and Participants

The location for the implementation of the Community Service Program was carried out in the area of the Majalengka Regency Education Office. This location was chosen based on considerations of accessibility, availability of facilities, and relevance to the target audience. This activity was attended by elementary, junior high, and high school / vocational school teachers who had previously attended the Computational Thinking Workshop Bebras Bureau of the University of Education Indonesia which was held on January 21-31, 2023 which had outcomes in the form of microteaching. Then from the results of the microteaching, monitoring or screening of which teachers implemented Computational Thinking through unplugged activities in learning on July 29, 2023. From the results of this monitoring, 50 teachers were selected who had previously attended the Computational Thinking Workshop of the Bebras Bureau of the Indonesian Education University from all districts in Majalengka Regency to take part in workshops and seminars as well as monitoring independent curriculum learning for elementary, junior high, and high school / vocational school teachers to implement Computational Thinking through unplugged activities in learning.

2.4. Methods of Data Collection and Processing

Data collection methods are carried out using document studies and questionnaires. The document study was carried out by analyzing the data that had been collected through Google Forms and Learning

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Management System (LMS) UPI Bebras Bureau. The data is in the form of microteaching results which are the output of the Computational Thinking Workshop Bebras Bureau of Universitas Pendidikan Indonesia. The microteaching results will be used for monitoring or screening related to teachers who have implemented Computational Thinking through unplugged activities in learning. Furthermore, these teachers are included in workshops and seminars as well as monitoring independent curriculum learning for elementary, junior high, and high school / vocational school teachers to implement Computational Thinking through unplugged activities in learning.

Questionnaires were used to survey teachers who participated in this activity which included data on understanding and needs related to Computational Thinking through unplugged activities in learning. The questionnaire was made in the form of a questionnaire using Google Forms and given to teachers through the WhatsApp group. After the data is collected, an in-depth analysis of the data and information that has been collected from various sources is conducted. This analysis involved identifying trends, patterns and needs that emerged from the survey results. These data are used to formulate the right approach in developing unplugged training and learning materials. This information will serve as a guideline in directing program development and designing trainings that are in line with the identified needs.

3. Results and Discussion

Workshop and seminar activities as well as monitoring of merdeka curriculum learning for elementary, junior high, and high school/vocational school teachers to implement Computational Thinking through unplugged activities in learning are attended by elementary, junior high, and high school / vocational school teachers who have previously attended the Computational Thinking Workshop Bebras Bureau of the Indonesian Education University which was held on January 21-31, 2023 which has outputs in the form of microteaching. Selected as many as 50 teachers who had previously attended the Computational Thinking Workshop Bebras Bureau of the Indonesian Education University from all districts in Majalengka Regency which has collaborated with the Majalengka Regency Education Office.

3.1. Learning Issues in the Merdeka Curriculum

Computational Thinking is an approach to problem solving that draws on computational thinking. It is not just limited to computer programming, but is a framework of thinking that can be applied in a variety of contexts. Some key aspects of Computational Thinking include.

- Decomposition: The ability to break down large problems into smaller, more manageable problems.
- Pattern Recognition: The ability to identify patterns or similarities in the data or problem at hand.
- Abstraction: The ability to identify important aspects of a problem and ignore irrelevant details.
- Algorithmic Thinking: The ability to design the steps or algorithms required to solve a problem.
- Evaluation: The ability to evaluate the resulting solution, both in terms of effectiveness and efficiency.

The need for 21st-century skills refers to a number of skills that are considered essential for individuals to succeed in the 21st century, especially in a changing work environment. Some of these skills include:

- Critical Thinking Skills: The ability to analyze information, make informed decisions, and critically evaluate arguments.
- Communication Skills: The ability to communicate effectively, both orally and in writing, and cooperate with others.
- Creative Thinking Ability: The ability to think innovatively, generate new ideas, and solve problems in unconventional ways.
- Computational Thinking Ability: The ability to apply concepts of computational thinking in everyday problem solving.
- Digital Literacy: The ability to use digital technologies, including computers and software, with proficiency.
- Problem Solving Skills: The ability to identify, design and implement solutions to complex problems.

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- Lifelong Learning Skills: The ability to continuously learn and adapt to changes in the work environment and technology.

An important and interesting competency for computer educators is computational thinking because it is related to critical thinking and problem solving. As an important area, computational thinking belongs to the skill set of 21st century competencies that have been recognized as important in various areas of study [23].

The approach to shape learners into computational thinkers by developing the six characteristics [24] of explaining, interpreting, applying, being aware of multiple perspectives, empathizing, and having self-knowledge) is an important approach in education. It helps students develop more analytical thinking, more effective problem solving, and relevant thinking skills for various contexts. Here is an example of a reflection on educators' understanding of computational thinking with reference to the six traits.

- Explaining: An educator can reflect on how they help students explain computational thinking concepts. For example, how they teach students to explain the algorithm or thought process used to solve a particular problem.
- Interpreting: Educators can reflect on how they help students interpret data and information. This could involve teaching how to analyze data or the results of a computer program.
- Applying: How do educators help students apply computational thinking concepts in real situations? An example could be how students can apply the algorithms they learn in everyday problem solving.
- Recognizing Multiple Perspectives: Educators can reflect on how they help students realize that there are different ways to solve problems, and that diverse perspectives can provide different insights.
- Empathizing: How do educators help students empathize with others who may have different understandings or experiences in computational thinking? This could mean thinking about how students can collaborate well in teams.
- Self-Awareness: Educators can reflect on how they help students develop their own self-knowledge in terms of strengths and weaknesses in computational thinking, and how they can continuously improve their skills.

To effectively integrate computational thinking in teaching, educators can adopt the following strategies:

- Phased Approach: Teach computational thinking concepts gradually, starting from simple to more complex, and build a strong foundation.
- Relevant Context: Connecting computational thinking to real situations or problems that are relevant to students so that they can see its value and applicability in everyday life.
- Active Learning: Encourages students to engage in problem solving, experiments, and projects that involve computational thinking.
- Collaboration: Encourages cooperation and collaboration between students to facilitate the exchange of ideas and understanding.
- Evaluation and Feedback: Provide constructive feedback to students on their progress in the development of computational thinking skills.

By adopting this approach, educators can help students internalize computational thinking as a daily habit of mind, which will help them in problem solving in various contexts.

Merdeka Curriculum is an educational curriculum concept that provides more flexibility to teachers and schools in determining what, how, and when subject matter is taught. It aims to provide more room for innovation in education and accommodate students' various learning styles as well as local needs. The Merdeka Curriculum promotes student-centered learning and gives teachers more autonomy in designing learning experiences that suit students' needs.

From the survey conducted on 42 teacher respondents on the availability of computer facilities at school for learning activities, 45.2% or 19 teachers considered that the availability of computer facilities

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for learning activities was good. As many as 16.7% or 7 teachers considered the availability of computer facilities to be very good, and as many as 26.3% or 11 teachers considered the availability of computer facilities to be quite good. Meanwhile, 11.9% or 5 teachers rated the availability of computer facilities for learning activities as poor. Based on this data, there are still computer facilities and infrastructure in schools that need to be improved for learning needs. This is a problem in the learning process. The survey results of teachers' assessment of the availability of computer facilities for learning activities can be seen in Fig. 2.

Fig. 2. Availability of Computer Facilities for Learning Activities

Although learning with Computational Thinking is closely related to computers and programming, Computational Thinking can be taught and practiced without using computers. This learning method is commonly known as unplugged learning.

With the problem of poor availability of facilities and infrastructure, and the arrival of the Merdeka Curriculum which requires Computational Thinking skills and there is an Unplugged learning method, this creates an idea to implement Learning in welcoming the Merdeka Curriculum with Unplugged Computational Thinking in each subject by teachers.

Computational Thinking Unplugged is an approach to teaching Computational Thinking concepts without using computers or software. This can be done through games, physical activities and simple tools to help students understand basic principles in computational thinking.

Implementing Computational Thinking in an independent curriculum can help students develop computational thinking skills that are essential in the 21st century, while allowing teachers to create relevant and engaging learning experiences. This can be done through a variety of teaching methods, including an unplugged approach that combines physical activity and problem solving. Thus, students can develop critical, creative and computational thinking skills while participating in their own centered learning.

3.2. Data and Information Collection

Data and information collection is carried out throughout the Community Service activities of the UPI Bureau Bebras Activities which organize Computational Thinking (CT) Training with several tasks until the teachers are asked to do Microteaching to implement CT in their learning and then asked to make video documentation to be uploaded into the Learning Management System (LMS). After this, a survey was conducted with the Google Form Cloud service to each Workshop and Seminar participant on July 29, 2023. The following is a list of questions on the survey in Table 1.

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Table 1. Questions in the Questionnaire

No	Quesioner
1.	Bagaimana penilaian ketersediaan fasilitas komputer di sekolah Bapak/Ibu untuk kegiatan pembelajaran?
2.	Bagaimana pemahaman Bapak/Ibu terkait *computational thinking* dengan metode *unplugged*?
3.	Apakah penggunaan metode unplugged berpotensi digunakan dalam pembelajaran?
4.	Bagaimana penguasaan Bapak/Ibu terhadap pembelajaran *unplugged*?
5.	Bagaimana ketertarikan Bapak/Ibu terhadap pembelajaran *unplugged*?
6.	Apakah metode *unplugged* bermanfaat dalam pembelajaran yang Bapak/Ibu ajarkan?

The results of the questionnaire in this survey were analyzed for the measurement needs of the implementation of the CT Unplugged Method in learning by teachers at the Majalengka Regency Education Office in welcoming the Merdeka Curriculum.

3.3. Implementation of Seminar and Workshop Activities

The Merdeka Curriculum was introduced to give schools and teachers the authority and freedom to design the curriculum and choose a variety of teaching tools that suit their needs and conditions. One aspect to welcome the independent curriculum is the application of Computational Thinking in learning, which allows students to develop computational thinking skills. Based on this, the Department of Computer Science Education of Universitas Pendidikan Indonesia through the Bebras Smart Movement Program of the Bureau of Universitas Pendidikan Indonesia in collaboration with the Majalengka district education office held a workshop for elementary, junior high, and high school / vocational school teachers to implement Computational Thinking which was carried out to improve teacher competence in applying Computational Thinking to the learning process. The activity was held on January 21-31, 2023. The output of the workshop activity is in the form of microteaching. Fig. 3 show a workshop.

(a) (b)

Fig. 3. 3a. and 3b. Opening of Computational Thinking workshop at Majalengka Education Office

Although the execution of Computational Thinking solutions usually uses computers, Computational Thinking can be taught without using computers. Unplugged as a solution to the problem of implementing Computational Thinking without involving computers, then from the output of the Computational Thinking workshop in the form of microteaching, further monitoring is carried out to find out teachers who have implemented Computational Thinking through unplugged activities in learning. Teachers who have these criteria are selected to take part in workshops and seminars as well as monitoring of independent curriculum learning for elementary, junior high, and high school / vocational school teachers to implement Computational Thinking through unplugged activities in learning held on July 29, 2023. Provision of Computational Thinking workshop material at the Majalengka Education Office show in Fig. 4.

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(a) (b)

Fig. 4. 4a. and 4b. Provision of Computational Thinking workshop material at the Majalengka Education Office

Selected as many as 50 teachers from Majalengka Regency who have collaborated with the Majalengka Regency Education Office. This activity was carried out by lecturers of the Department of Computer Science Education, Faculty of Mathematics and Natural Sciences Education, Universitas Pendidikan Indonesia. In this activity, the teaching lecturers provided material on the Interpretation of the Independent Curriculum Concept on Computational Thinking by Dr. Asep Wahyudin, S.Kom, M.T., Embodiment of Computational Thinking in Learning by Eddy Prasetyo Nugroho, M.T., and Implementation of Unplugged Computational Thinking in Learning by Ani Anisyah, M.T. and Nusuki Syariati Fatimah, M.Pd. The lecturers provided material directly to participants from various levels of education. Participants engaged in unplugged activities designed to teach Computational Thinking concepts with interactive methods show in Fig. 5.

(a) (b)

Fig. 5. (a) Providing material Optimizing learning in the Merdeka curriculum. 5b. Providing material on the embodiment of Computational Thinking in Learning

After the implementation of the various workshops, the program team conducted an evaluation of the activities. This evaluation involves participants providing feedback on the materials, methods and their experience during the workshop. The results of this evaluation are used to make improvements and adjustments to the overall program. Through this series of core activities, participants gained in-depth experience in applying computational thinking concepts through unplugged activities. These activities provide opportunities to interact directly with the materials, instructors, and peers, all of which aim to improve participants' understanding and skills in applying Computational Thinking through unplugged activities in learning. Application of Computational Thinking through show in Fig. 6.

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(a) (b)

Fig. 6. (a) Providing unplugged activity material at the Computational Thinking through unplugged activity workshop at the Majalengka Education Office. (b). Application of Computational Thinking through unplugged activity

3.4. Description of Target Communities

This activity is aimed at several target audience groups, namely teachers of elementary schools, junior high schools, high schools and vocational high schools under the auspices of the Majalengka Regency Education Office. In this service program, teachers are taught about the concept of Computational Thinking, especially unplugged learning. In addition, in this service teachers are introduced to integrating the unplugged concept into learning in various subjects. This activity brought in participants as many as 50 teachers from all districts in Majalengka Regency who have collaborated with the Majalengka Regency Education Office.

By involving this diverse target audience, it is hoped that this community service program can have a wider and more sustainable impact in introducing and developing an understanding of computational thinking in the context of learning and everyday life.

3.5. Data Analysis of Activity Results and Findings

There were 42 respondents from the survey results of the seminar and training activities "Evaluation of Optimizing Unplugged-based Computational Thinking Capabilities in Interpreting the Independent Curriculum Context".

The need to improve facilities for Computational Thinking learning needs that require computer devices can be overcome by learning without using computer devices through unplugged learning. Related to this, there is a survey on the potential use of using the unplugged method in learning. As a result, as many as 94.6% or 41 teachers consider the unplugged method to be potentially used in learning and only 2.4% or 1 teacher who considers the unplugged method less potential to be used in learning. So from the results of this survey, the use of unplugged methods has the potential to be used in learning. Survey results related to the potential use of unplugged methods in learning can be seen in Fig. 7.

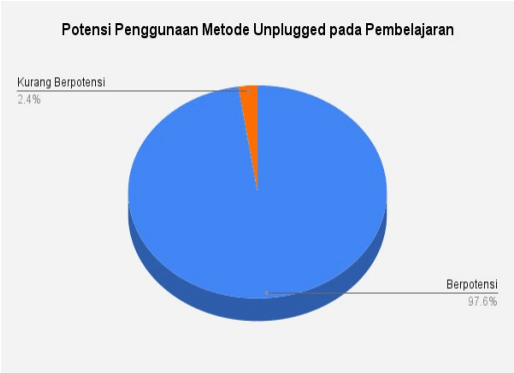

Fig. 7. Potential Use of Unplugged Method in Learning

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In addition to the survey of the potential use of unplugged methods in learning where 94.6% considered the potential. From this potential, can it make teachers interested in unplugged learning. Related to this, there is a survey related to teachers' interest in unplugged learning. As a result, 61.9% of teachers are very interested in unplugged learning, 35.7% of teachers are interested in unplugged learning, only 2.4% or 1 teacher is quite interested in unplugged learning. It can be concluded that teachers are very interested in unplugged learning, the results can be seen in Fig. 8.

Fig. 8. Teachers' Interest in Unplugged Learning

From the survey results of teachers' interest in unplugged learning who consider unplugged learning very interesting. From this interest, do teachers consider that unplugged learning is useful to be implemented. The survey results related to the benefits of the unplugged method in learning, as many as 85.7% of teachers consider that the unplugged method in learning is very useful, 11.9% of teachers consider it useful, and only 2.4% or 1 teacher who considers the unplugged method in learning is quite useful. So it can be concluded that the unplugged method is very useful in learning. The survey results can be seen in Fig. 9.

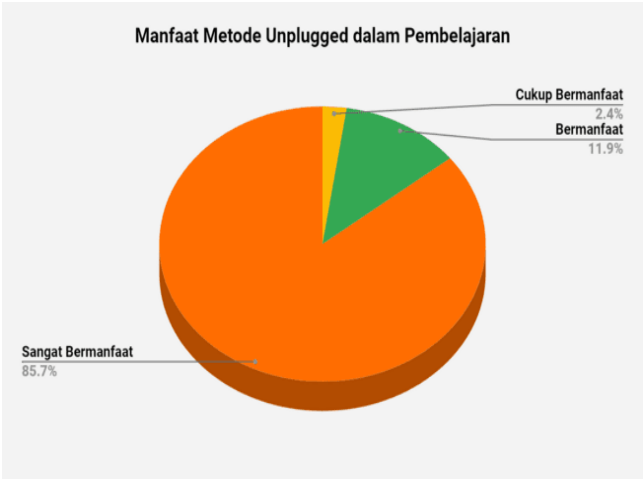

Fig. 9. Benefits of the Unplugged Method in Learning

In relation to the survey results of teachers who consider the unplugged method very useful to be applied in learning, from this it can be seen whether it can make the unplugged method important in the learning process. Here is a survey regarding the importance of the unplugged method to support the learning process which can be seen in Fig. 10. From the survey results, 78.6% of teachers consider the unplugged method very important to support the learning process, then as many as 19% of teachers consider it important and only 2.4% or 1 teacher who considers the unplugged method quite important to support the learning process. So it can be concluded that the unplugged method is very important to support the learning process.

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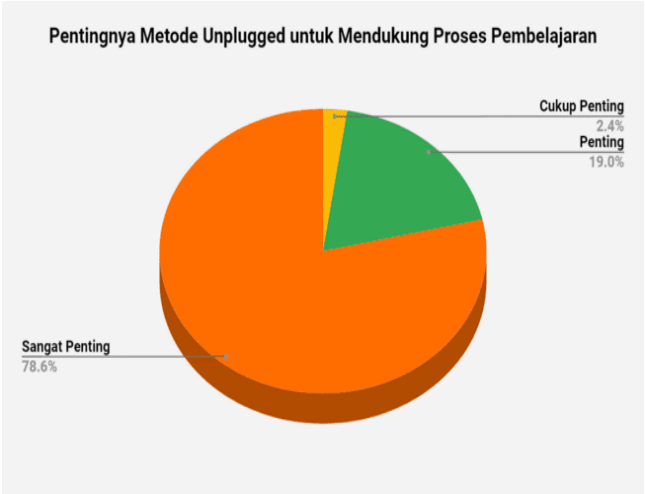

Fig. 10. The Importance of the Unplugged Method to Support the Learning Process

There is still a need to improve facilities and infrastructure in schools, potentially using the unplugged method for learning Computational Thinking without using computer devices. So that it can cause teacher interest in unplugged learning, because it is useful and important for the learning process of Computational Thinking without the need for computer devices. From the teacher's response to the interest, benefits, and importance of using the unplugged method to support learning, it can make teachers have an understanding and mastery related to Computational Thinking with the unplugged method. Related to that, teachers gave their responses to their understanding of Computational Thinking with the unplugged method. The survey results show that 54.8% or 23 teachers have a good understanding of Computational Thinking with the unplugged method, 28.6% or 12 teachers have a very good understanding of Computational Thinking with the unplugged method, and 16.7% or 7 teachers have a fairly good understanding of Computational Thinking with the unplugged method. It can be concluded that teachers' understanding of Computational Thinking with the unplugged method is good. The survey results of teachers' responses to their understanding of computational thinking with the unplugged method can be seen in Fig. 11.

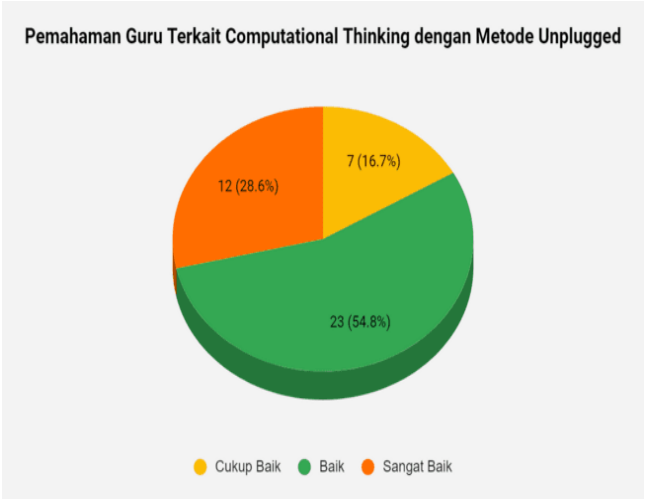

Fig. 11. Teachers' Understanding of Computational Thinking with the Unplugged Method

In connection with the survey results of teachers' good understanding of Computational Thinking with the unplugged method, there are responses related to teacher mastery of unplugged learning. The results of responses related to teacher mastery of learning, as many as 54.8% or 23 teachers mastered unplugged learning well. As many as 28.6% or 12 teachers moderately mastered unplugged learning, and as many as 16.7% or 7 really mastered unplugged learning. So it can be concluded that teachers' understanding and mastery of unplugged learning are equally good. The survey results of teachers' mastery of unplugged learning can be seen in Fig. 12.

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Fig. 12. Teachers' Mastery of Unplugged Learning

3.6. Obstacles Encountered

In the implementation of workshops and seminars as well as monitoring of independent curriculum learning for elementary, junior high, and high school / vocational school teachers to implement Computational Thinking through unplugged activities in learning, there are several obstacles that affect the course of activities. Some of the obstacles experienced include limited technical resources, an activity timeline that does not match or retreat from the initial plan, the collection of participant assignments from workshop activities held by the UPI Bebras Bureau which is not optimal where the data is needed for this training and seminar activity, the location of some participants who are far from the location of the activity which has the potential to make the event timeline retreat.

3.7. Impact and Sustainability Measures

Every obstacle is considered as an opportunity to make improvements and adjustments. Impact and Efforts made from the obstacles faced. The constraints of limited technical resources can have an impact on the process of implementing activities both before and during the activities. Efforts were made to overcome these obstacles by the committee team identifying the necessary resources at the beginning and trying to gather the necessary technical support. Collaboration with the technical staff of the Majalengka District Education Office can help overcome this limitation.

Regarding the task collection constraints, efforts can be made to follow up on information notifications and communication through the platform used to inform all related to the activity implementation process.

The potential of subjects that can be implemented by the CT Unplugged method requires teachers to always be creative in exploring the potential of content standards with facilities and infrastructure in schools with 6 21st century skills in welcoming the Merdeka Curriculum.

Then related to the constraints of the activity timeline which was delayed from the initial plan due to the synchronization of schedules with the Majalengka Regency Education Office and the location of some participants who were far from the location of the activity, could have an impact on the smooth running of the activity. Efforts made are required cooperation and communication to adjust the schedul.

4. Conclusion

In seeking to improve teacher competence in welcoming the independent curriculum to improve critical thinking and problem solving skills, Computational Thinking can be applied in learning. Based on survey data of teachers in Majalengka regarding the availability of computer facilities, 11.9% rated it as poor so that it still needs to be improved for Computational Thinking learning needs that require computer devices can be overcome by learning without using computer devices through unplugged learning. Through organizing training and seminars as well as monitoring independent curriculum learning for elementary, junior high, and high school / vocational school teachers in Majalengka to implement

ISSN 1978-0524 (print) | 2528-6374 (online) Vol. 8., No. 3, December 2024, pp. 193-207

Computational Thinking through unplugged activities in learning by the Department of Computer Science Education, FPMIPA, UPI shows that 54.8% of teachers understand and master Computational Thinking well with the unplugged method, 78.6% of teachers consider the unplugged method very important to support the learning process. These results show that teachers understand and master well and consider that the application of Computational Thinking through unplugged activities in learning is very important.

Acknowledgment

Our gratitude goes to the Faculty of Mathematics and Sciences Education, Universitas Pendidikan Indonesia for funding this activity through the Community Service Program in the 2023 Annual Work Plan and Budget, the Institute for Research and Community Service, Universitas Pendidikan Indonesia, and also the Majalengka Regency Education Office as a partner in this activity.

Declarations

Author contribution. All authors contributed equally to the main contributor to this paper. All authors read and approved the final paper.
Funding statement. None of the authors have received any funding or grants from any institution or funding body for the research.
Conflict of interest. The authors declare no conflict of interest.
Additional information. No additional information is available for this paper.

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