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**Letter of Acceptance for Full Paper**

Dear authors: Mohammad Salehudin, Yunita Noor Azizah, Anwaril Hamidy, Bambang Iswanto, and Fatur Rahman

We are pleased to inform you that after peer-reviewed, your article ID: 2346, entitled:

**"Learning ICT with Computational Thinking approach to improve problem solving ability in junior high school students"**

has been **ACCEPTED** in the 2nd International Conference on Technology, Informatics, and Engineering (ICon-TINE) 2022. Your paper will be proceeed to be published in AIP Proceeding.

Thank you for considering this conference as a venue for your work. The technical issues about the publication will be informed later. Thank you for participating in our event.

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# Learning ICT With Computational Thinking Approach To Improve Problem Solving Ability In Junior High School Students

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**Abstract.** The purpose of this study is to describe ICT learning with a computational thinking approach to improve problem solving skills in junior high school students. The research uses a Mixed method approach, qualitative data with interviews, while quantitative data using a questionnaire with validated instruments, the data is analyzed with each approach used with the help of SPSS version 27. The results of the study found that qualitatively students' abilities are still far from utilizing the dimensions of computational thinking. because it is not always introduced or used in learning, while quantitative data obtained a significant ANOVA value of 0.000 > 0.05 which states that ICT learning with a computational thinking approach has a significant effect. There needs to be special handling so that students are able to think critically and be able to solve the problems they face with dimensions or patterns in computational thinking.

**Keywords:** ICT learning, computational thinking, problem solving ability

## INTRODUCTION

The trend of 21st century learning is directed to make the students owned critical thinking skills [1], because to adapt the conditions of technological and scientific development students are expected to be better with critical thinking skills [2] [3], even good learning is directed to complete student learning problems. However, not much has been discussed on computational thinking skills in Information and Communication Technology lessons in junior high school, while computational thinking has the ability to solve learning problems and problem-solving skills in a student environment [4].

Junior high schools in Indonesia currently use a new curriculum, the 2013 curriculum and an independent curriculum, the underlying of this curriculum is using constructivistic learning theory, as well as a theory that animates this curriculum, in this theory every learning prioritizes students' ability to learn and makes students independent in learning. So that all subjects apply the curriculum well, including in the subject of Information and Communication Technology in junior high school, ICT learning at the Education level adapts to the curriculum, taught to students to know the use of information technology, the use of computers and the introduction of computer devices to students.

However, there has not been much discussion about the use of computational thinking skills in junior high school students in Indonesia, and more specifically in the field of ICT subjects, even though according to Xiaodan Tang et al, who mentioned that what can be introduced to students is about programming, documenting and understanding software and even designing for use. Meanwhile, they have also classified computational thinking into four main categories with 22 sub-skills, including computational problem-solving practices and system thinking practices [5]. Meanwhile, the virtues of computational thinking will provide great benefits to students, as explained by Irene lee et.al., who mentioned that computational thinking will be useful for approaching new problems for adolescents for three important domains, namely abstraction, automation and analysis [6].

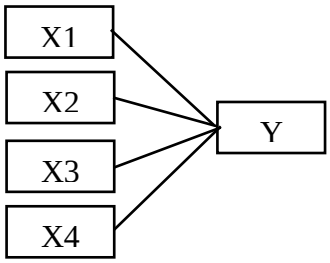
Many advantages are expected with computational thinking skills for students, especially the concepts and definitions possessed by computational thinking involve four important dimensions, they are abstraction, decomposition, generalization and algorithms [7], for teachers who teach knowledge in class, it would be better to use this computational thinking ability, because students will be able to solve the problem, and students can effectively and efficiently make work and problems can be done well. The advantages of computational thinking skills should be taught in all schools, developing various computational abilities with ideas integrated into other disciplines [8].

Interestingly, the problem of computational thinking ability in school students at all levels of education, the purpose of this study is to describe ICT learning with a computational thinking approach to improve problem-solving skills in Junior High School students.

## METHODS

This research uses a Mixed method approach, this research was held at Madrasah Tsanawiyah Negeri 1 Balikpapan, in two classes in grade VIII. Then for qualitative data, this study uses data collection techniques with interviews [10], [11] to 3 students who are considered to represent research informants with key questions about how students' knowledge uses computational thinking skills in their ICT learning. Qualitative analysis with the model of Miles and Huberman [12].

Quantitative data on student respondents who became respondents were set in two selected learning classes in grade VIII, all quantitative data using a questionnaire amounted to X1 six items, X2 eight questions items, X3 seven questions items, X4 seven questions and Y seven questions. Questionnaires are distributed using google forms which are done regularly and handed back by respondents via google forms, then all the incoming data is discussed and analyzed, the number of respondents collected is 67 respondents. Furthermore, quantitative data were analyzed using regression analysis and one way ANOVA using SPSS 27. To clarify the form of this research, it can be seen in the research design as follows:




Picture 1. Research design

## RESULTS AND DISCUSSION

**Qualitative Results**

The results of this study founded that qualitatively students' abilities still need to be developed, there are some students who are still not maximally using this ability in their learning, from utilizing the dimensions of computational thinking. The reason students are not optimal because they are not always introduced or used computational thinking method in learning, the results of interviews with three informants concluded that they were able to use the basic parts of the four dimensions of computational thinking, some were able to use the algorithmic dimension, there were students who liked decomposition, that students are able to solve problems in learning ICT and they work on because students choose the part which they like and the part they develop.

The relationship between ICT learning in grade VIII is to learn the basic part of computer technology knowledge and the information part that students can carry out in the ability to use technology in their learning in particular. In

addition to the brief theory they obtained, students immediately practiced using computer devices available in the school laboratory. So this study draws conclusions, students are able to solve their learning problems by using the dimension of computational thinking according to their preferences in what dimension they choose.

**Quantitative results**

The results of the study from the questionnaire distributed to grade VIII students found that the respondents' answers showed that overall variables had a significant effect, which showed that ICT learning with computational thinking has an effect on problem-solving ability (PSA) in junior high school students. The calculated value of 0.000 < 0.05. Outlined in table 1 below:

**Table 1**. One way ANOVA analysis: Computational Thinking on Problem Solving Ability (PSA)

| ANOVA | | | | | | |
|---|---|---|---|---|---|---|
| | | Sum of Squares | df | Mean Square | F | Sig. |
| Abstraction (A) | *Between Groups* | 555.392 | 15 | 37.026 | 5.876 | .000 |
| | *Within Groups* | 327.667 | 52 | 6.301 | | |
| | *Total* | 883.059 | 67 | | | |
| Generalization (G) | *Between Groups* | 1342.892 | 15 | 89.526 | 7.902 | .000 |
| | *Within Groups* | 589.167 | 52 | 11.330 | | |
| | *Total* | 1932.059 | 67 | | | |
| Decomposition (D) | *Between Groups* | 992.833 | 15 | 66.189 | 9.886 | .000 |
| | *Within Groups* | 348.167 | 52 | 6.696 | | |
| | *Total* | 1341.000 | 67 | | | |
| Algorithms (A) | *Between Groups* | 1211.608 | 15 | 80.774 | 28.127 | .000 |
| | *Within Groups* | 149.333 | 52 | 2.872 | | |
| | *Total* | 1360.941 | 67 | | | |

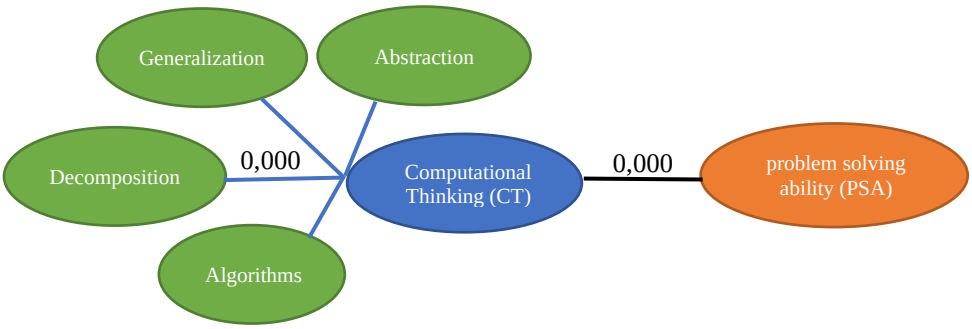
Obtained a significant ANOVA value of 0.000 > 0.05, both partially each variable states that ICT learning with a computational thinking approach has a significant effect. It is necessary to have special handling so that students are able to think critically and are able to solve the problems they face with dimensions or patterns in computational thinking. While the calculation results were simultaneously found to be calculated results of 0.000 < 0.05, the computational thinking variables in ICT lessons affect the problem solving ability for students.

**Table 2. Regression Analysis:** Computational Thinking on Problem Solving Ability (PSA)

| ANOVA[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Sum of Squares | df | Mean Square | F | Sig. |
| 1 | Regression | 1790.049 | 4 | 447.512 | 39.266 | .000[b] |
| | Residual | 718.010 | 63 | 11.397 | | |
| | Total | 2508.059 | 67 | | | |

a. Dependent Variable: PSA
b. Predictors: (Constant), A, G, AB, D

Picture 2 below shows the results of this study, that the variable of computational thinking on students' problem-solving abilities in their learning activities, students need to find out how they deal with problems and how they solve learning problems, through the dimensions of computational thinking found appropriate ways to students are able to face problems and solve them effectively and efficiently.




**Picture 2**. The results of the analysis of research variables on PSA

After obtaining the results of this study, that problem-solving ability in students is how students manage ideas and define the various problems they faced. So in accordance with previous research that found also that students can be based on defining problems (problem Finding) and comparing ideas to identify the most creative ones (Solution Finding) [13], students can take the right steps in solving their problems, by understanding challenges, generating ideas, preparing for action, and students can plan their own approach is a major factor in the process of creatively solving problems [14].

In relation to problem solving, computational thinking is an effort to think that encompasses the ability to think in preventing, protecting, and how to recover with the worst-case scenario through redundancy, damage containment, and error correction, as well as how computational thinking uses heuristic reasoning to find solutions in solving problems from planning, learning and scheduling to be synchronized meeting with each other.

The findings are also in line with Wing et al's statement, that the role of "Computational Thinking" in all disciplines, sparks deep engagement with core questions about what computer science is and what might contribute to solving problems across the spectrum of human inquiry. So Wing's opinion that advances in computing allow new problem-solving strategies to emerge and to test new solutions both in the virtual world and the real world [15], it is also evident in the learning of mathematics that there are three main benefits to the approach of the cultivation of computational thinking in this context: (1) it builds on the interrelationships for learning between computational thinking and mathematics and science domains, (2) it addresses practical concerns of reaching all students, and having capable teachers, and (3) bringing science and mathematics education more appropriate with current professional practice in this field [7] This ability can be defined as a way of thinking processes; abstraction or description of the problem, decomposition of the problem into smaller parts, drawing up problem solving algorithms, evaluating solutions, generalizing other problem solving and automation of solutions [16].

That ICT learning by using computational thinking skills, that very few students are able to succeed in tasks related to succeed in tasks related to using information as producers, students are able to develop their own ideas in a digital environment and less than one fifth are able to filter digital information and make representations in a digital environment. Socio-economic groups, access, daily use, and confidence in carrying out ICT-related activities are all positively related [17], as a study had initially identified factors related to students' ICT competence [18].

## CONCLUSIONS

The results of the study found that computational thinking is an effort to solve problems through ideas, stages and steps of completion that are measurable and interesting for students in solving learning problems, students are able and have new ways of problem-solving abilities according to the dimensions contained in the computational thinking, which includes abstraction, generalization, decomposition and algorithms. ICT learning using computational thinking will have a significant effect on students' ability to solve problems effectively and efficiently.

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This is to certify that the paper entitled

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authored by

**Mohammad Salehudin, Yunita Noor Azizah, Anwaril Hamidi**

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