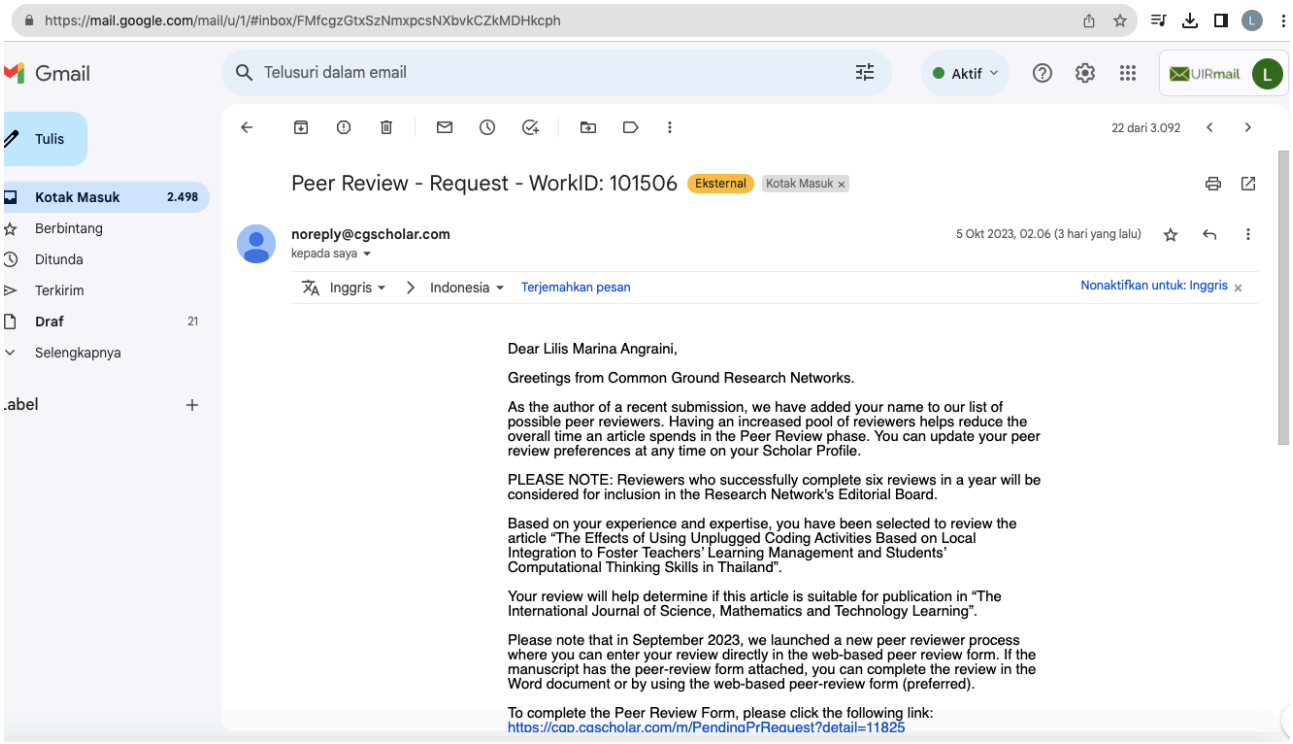
1. Permintaan review (05 Oktober 2023)



Gmail

Telusuri dalam email

Aktif

UIRmail

Tulis

Kotak Masuk 2.498

Berbintang

Ditunda

Terkirim

Draf 21

Selengkapnya

Label

22 dari 3.092

Peer Review - Request - WorkID: 101506 Eksternal Kotak Masuk ×

noreply@cgscholar.com

kepada saya

5 Okt 2023, 02.06 (3 hari yang lalu)

Inggris Indonesia Terjemahkan pesan

Nonaktifkan untuk: Inggris ×

Dear Lilis Marina Angraini,

Greetings from Common Ground Research Networks.

As the author of a recent submission, we have added your name to our list of possible peer reviewers. Having an increased pool of reviewers helps reduce the overall time an article spends in the Peer Review phase. You can update your peer review preferences at any time on your Scholar Profile.

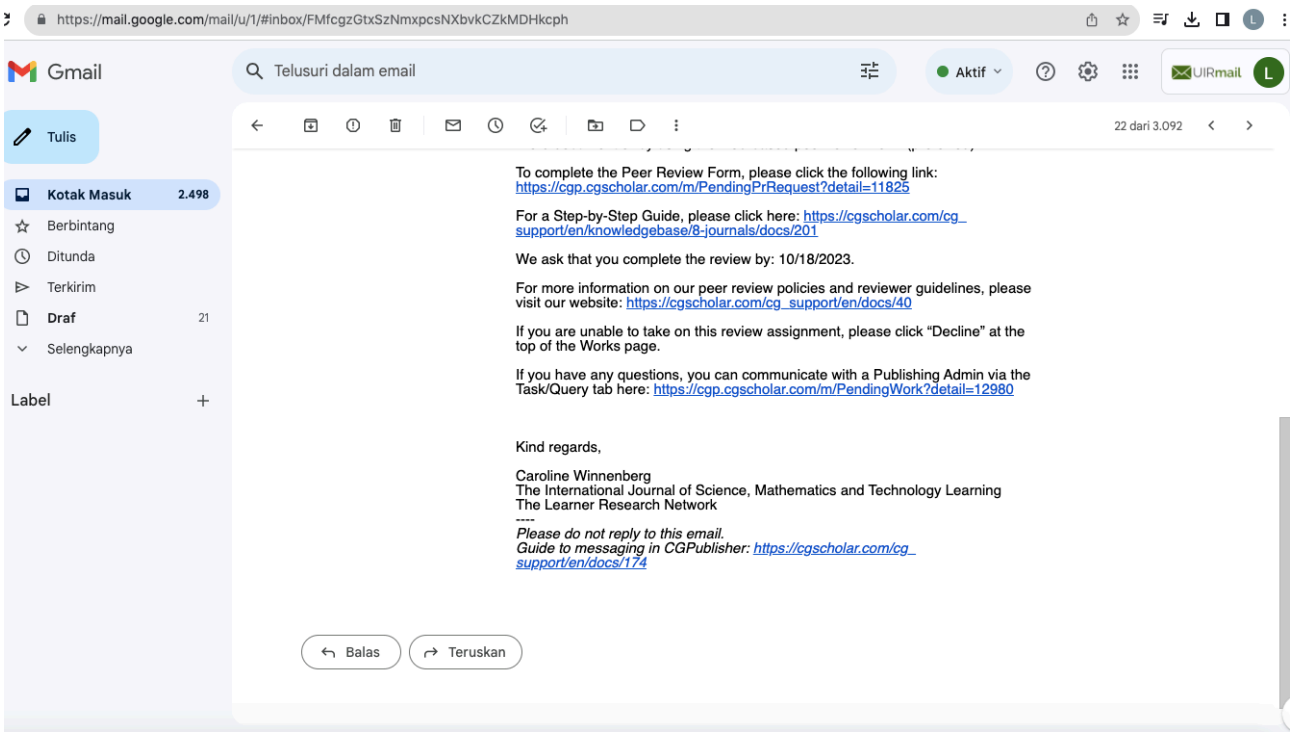
PLEASE NOTE: Reviewers who successfully complete six reviews in a year will be considered for inclusion in the Research Network's Editorial Board.

Based on your experience and expertise, you have been selected to review the article "The Effects of Using Unplugged Coding Activities Based on Local Integration to Foster Teachers' Learning Management and Students' Computational Thinking Skills in Thailand".

Your review will help determine if this article is suitable for publication in "The International Journal of Science, Mathematics and Technology Learning".

Please note that in September 2023, we launched a new peer reviewer process where you can enter your review directly in the web-based peer review form. If the manuscript has the peer-review form attached, you can complete the review in the Word document or by using the web-based peer-review form (preferred).

To complete the Peer Review Form, please click the following link:
https://cgp.cgscholar.com/m/PendingPrRequest?detail=11825



https://mail.google.com/mail/u/1/#inbox/FMfcgzGtxSzNmxpcsNXbvkCZkMDHkcph

Gmail

Telusuri dalam email

Aktif

UIRmail

Tulis

Kotak Masuk 2.498

Berbintang

Ditunda

Terkirim

Draf 21

Selengkapnya

Label

22 dari 3.092

To complete the Peer Review Form, please click the following link:
https://cgp.cgscholar.com/m/PendingPrRequest?detail=11825

For a Step-by-Step Guide, please click here: https://cgscholar.com/cg_support/en/knowledgebase/8-journals/docs/201

We ask that you complete the review by: 10/18/2023.

For more information on our peer review policies and reviewer guidelines, please visit our website: https://cgscholar.com/cg_support/en/docs/40

If you are unable to take on this review assignment, please click "Decline" at the top of the Works page.

If you have any questions, you can communicate with a Publishing Admin via the Task/Query tab here: https://cgp.cgscholar.com/m/PendingWork?detail=12980

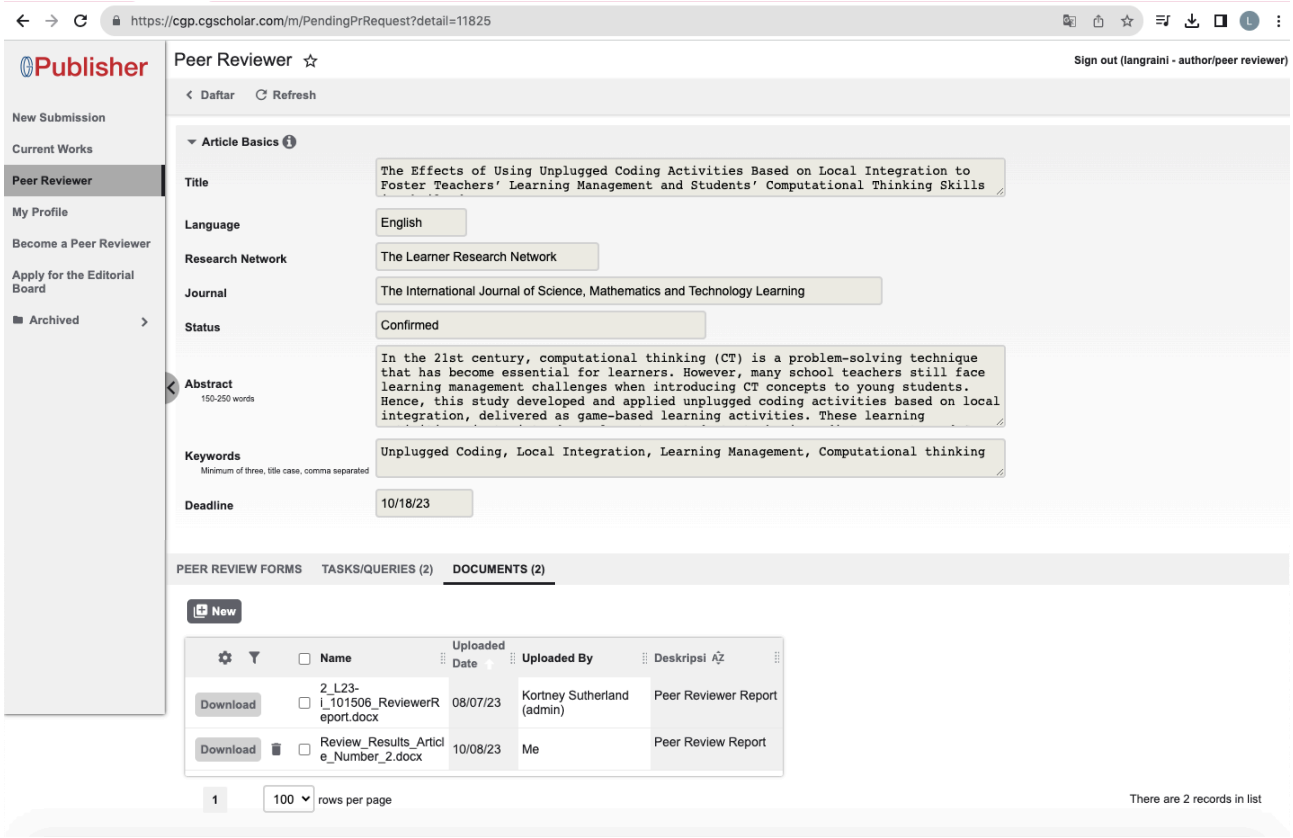
Kind regards,

Caroline Winnenberg
The International Journal of Science, Mathematics and Technology Learning
The Learner Research Network

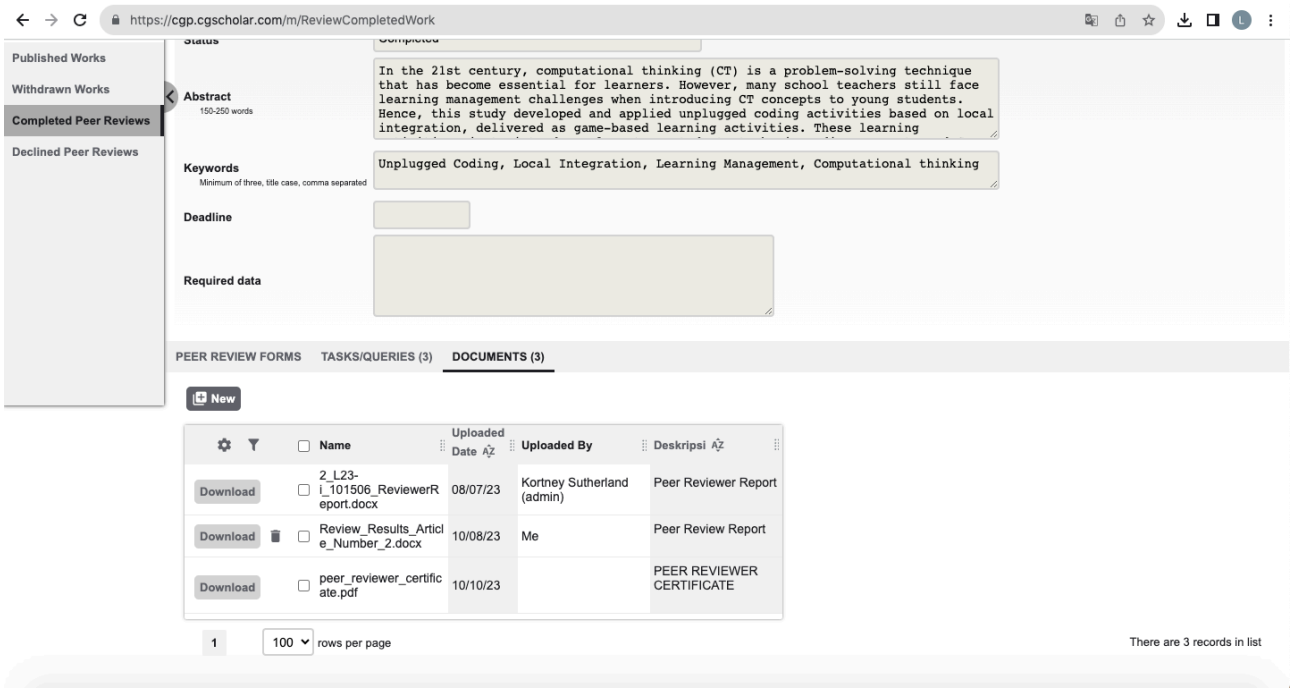
Please do not reply to this email.
Guide to messaging in CGPublisher: https://cgscholar.com/cg_support/en/docs/174

Balas Teruskan

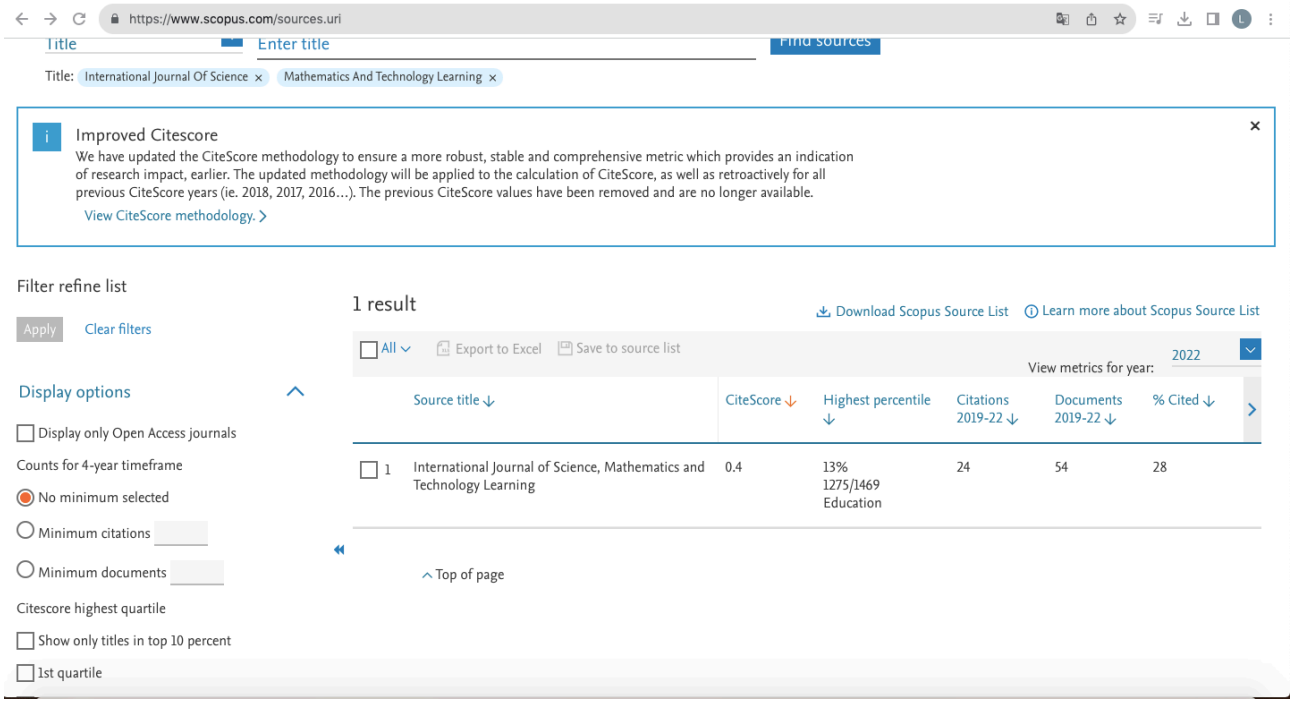
2. Penyerahan hasil review (08 Oktober 2023)



3. Pengiriman sertifikat reviewer (10 Oktober 2023)



4. Bukti Jurnal Terindeks Scopus Q4



COMMON GROUND

10/10/23

To Whom It May Concern,

This letter certifies that Lilis Marina Angraini has successfully completed a peer-review report for an article under publication consideration by Common Ground Research Networks. We express gratitude for their contribution and expertise as a reviewer. Their feedback has enriched the value of *The International Journal of Science, Mathematics and Technology Learning.*

This peer-review report was verified on 10/10/23. We have certified that Lilis Marina Angraini's report is complete and that it satisfies the requirements of our evaluation rubric. Our approach to peer review seeks to be inclusive, founded on a rigorous, merit-based, two-way anonymous peer-review processes. Common Ground Research Networks takes intellectual integrity seriously. The publisher, editors, reviewers, and authors all agree upon a standard of expected ethical behavior, which is based on the Committee on Publication Ethics (COPE) Core Practices.

Yours Sincerely,

Dr. Phillip Kalantzis-Cope
Chief Social Scientist, Common Ground Research Networks

Common Ground Research Networks

Address: University of Illinois Research Park 2001 South First St, Suite 201L Champaign, IL 61820

Email: support@cgnetworks.org

Website: https://cgnetworks.org

COMMON GROUND

Dear Reviewer,

Thank you in advance for reviewing the following article. Peer reviewers are selected from members of the Editorial Board, a list of volunteers, or current authors. Volunteers are given assignments if they have volunteered as a reviewer and possess qualifying credentials. Authors/co-authors of submitted articles who have passed our initial quality inspections are also eligible to be selected as reviewers. We request that you respect the peers reviewing your own submission by reciprocating this responsibility. We thank you for offering your time and expertise.

Please be mindful that you belong to a community of scholars, educators, and practitioners who devote their energy to sharing knowledge. Always be respectful and professional when providing feedback. Reviewers are encouraged to be critical, constructive, and, above all, respectful.

Reviewer responsibilities and resources can be found via the following links:

Duties of Reviewers

How to Complete a Peer Review Report

Frequently Asked Questions

If you have any questions about the peer-review process, please contact us for assistance.

Sincerely,

CG Journal Publishing Team

Common Ground Research Networks

University of Illinois Research Park

60 Hazelwood Drive

Champaign, IL 61820 USA

https://cgscholar.com/cg_support

Reviewer Report

Article for Review:	The Effects of Using Unplugged Coding Activities Based on Local Integration to Foster Teachers' Learning Management and Students' Computational Thinking Skills in Thailand
Research Network:	Learner

Instructions

- Provide a response and score for each of the five sections.
- Kindly use concrete examples when offering criticism and feedback.
- Please do not offer advice or criticism regarding styles or formatting.
- This file contains the manuscript for review. When returning reports, the manuscript must remain attached to verify the report appropriately matches the correct manuscript.
- Each category is scored on a range of 0 to 5 points.

0	1	2	3	4	5
Very Poor	Poor	Below Average	Above Average	Good	Very Good

Scoring Summary

After providing a written response for each the five evaluation criteria, please total your scores below.

EVALUATION CRITERIA	SCORE
1. Empirical Grounding	3__ of 5
2. Conceptual Modeling	2__ of 5
3. Explanatory Logic	3__ of 5
4. Implications and Applications	3__ of 5
5. Quality of Communication	2__ of 5
TOTAL SCORE	13__ of 25

1. Thematic Focus and Empirical Grounding

When considering the Thematic Focus and Empirical Grounding, please use the following prompts to guide your overall response and evaluation.

- Is this a topic that needs addressing?
- Is the area investigated by the article: significant? timely? important? in need of addressing because it has been neglected? intrinsically interesting? filling a gap in current knowledge?
- Are data collection processes, textual analyses, or exegeses of practice sufficient and adequate to answer the research questions?
- Does the article adequately document, acknowledge, and reference the existing findings, research, practices, and literature in its field?
- Does the article relate in a coherent and cogent way with issues of real-world significance?

RESPONSE:

- In this article, the research theme discussed is the development of Computational Thinking (CT) skills through unplugged coding activities with local integration. However, the article does not provide sufficient explanation on why this theme is important or relevant in an educational context. There is no in-depth discussion of the needs or challenges faced in developing CT skills or why unplugged coding with local integration is considered an effective approach. In addition, the article is also lacking in the empirical foundation on which the research is based. While the article mentions data collection through pre- and post-tests and evaluation of teachers' lesson management performance, there is not enough explanation of the data collection methods, the instruments used, or the data analysis conducted. This reduces the strength of the study and makes it difficult for readers to evaluate the reliability and validity of the findings. In this regard, the article could be improved by providing a more detailed explanation of the research themes and providing a stronger empirical foundation to support the findings.

SCORE:

- 3__ of 5

2. Conceptual Model

When considering the Conceptual Model, please use the following prompts to guide your overall response and evaluation.

- Are the main concepts or categories appropriate to the investigation?
- Should other concepts or categories have been considered?
- Are key concepts adequately defined? Are they used consistently?
- Does the article make necessary or appropriate connections with existing theory?
- Does the article develop, apply, and test a coherent and cogent theoretical position or conceptual model?

RESPONSE:

- The article does not present a complete picture of how the variables involved are interconnected and how they contribute to the research results. Although the article presents the research framework in the form of a diagram (Figure 1), this diagram does not provide an adequate explanation of the relationship between the variables. There is no explanation of how unplugged coding activities with local integration contribute to the development of students' computational thinking skills or how teachers' learning management performance can influence the research results. This lack of clarity in the conceptual model makes it difficult for readers to understand the relationship between the variables studied and how they influence each other. A more detailed explanation of the conceptual model used would help the reader to understand the theoretical framework of the study and provide a stronger foundation for the resulting findings.

SCORE:

- 2__ of 5

3. Explanatory Logic

When considering the Explanatory Logic, please use the following prompts to guide your overall response and evaluation.

- How effectively does the article reason from its empirical reference points?
- Are the conclusions drawn from the data, texts, sources, or represented objects clear and insightful? Do they effectively advance the themes that the article sets out to address?
- Does the article demonstrate a critical awareness of alternative or competing perspectives, approaches, and paradigms?
- Is the author conscious of his or her own premises and perhaps the limitations of his or her perspectives and knowledge-making processes?

RESPONSE:

- There is a lack of adequate explanation of the cause-and-effect relationship between the variables studied and how unplugged coding activities with local integration can effectively improve students' computational thinking skills. Although this article presents the finding that unplugged coding activities with local integration have a positive effect on students' CT skills, the explanation of the mechanism or process that explains why and how this happens is not detailed enough. The article does not provide an in-depth analysis of why unplugged coding activities with local integration can improve students' CT skills, or how local integration can influence the learning and development of CT skills. A more detailed explanation of the cause-and-effect relationships between the variables studied and the mechanisms underlying the positive effects of unplugged coding activities with local integration would provide a better understanding of the contribution of this research in the development of students' CT skills.

SCORE:

- 3__ of 5

4. Implications and Applications

When considering the Implications and Applications, please use the following prompts to guide your overall response and evaluation.

- Does the article demonstrate the direct or indirect applicability, relevance, or effectiveness of the practice or object it analyzes?
- Are its implications practicable?
- Are its recommendations realistic?
- Does the article make an original contribution to knowledge?
- To what extent does it break new intellectual ground?
- Does it suggest innovative applications?
- What are its prospects for broader applicability or appreciation?
- How might its vision for the world be realized more widely?

RESPONSE:

- The article does not provide an in-depth discussion on how the research findings can be applied in everyday teaching or how the results of this study can contribute to curriculum development or learning strategies. There is no explanation on how unplugged coding activities with local integration can be integrated into the curriculum or how teachers can adopt this approach in their teaching. In addition, the article also does not provide clear implications on how the findings of this study can contribute to our understanding of the development of computational thinking skills or how this study can provide new insights into effective learning approaches. In this regard, the article could be improved by providing a more detailed explanation of the implications of the findings of this study in the context of education and teaching practices, as well as providing greater insight into the contribution of this study to our understanding of CT skill development.

SCORE:

- 3__ of 5

5. Quality of Communication

When considering the Quality of Communication, please use the following prompts to guide your overall response and evaluation.

- Is the focus of the article clearly stated (for instance, the problem, issue, or object under investigation; the research question; or the theoretical problem)?
- Does the article clearly express its case, measured against the standards of the technical language of its field and the reading capacities of audiences academic, tertiary student, and professional?
- What is the standard of the writing, including spelling and grammar?
- If necessary, please make specific suggestions or annotate errors in the text.

RESPONSE:

- The article uses tables and diagrams to present data and research findings, but does not always provide adequate explanations of what the tables and diagrams represent. For example, in Table 4, there is no explanation of what each assessment criterion measures or how the average scores achieved by the teachers can be interpreted. The same goes for Table 5 and Table 6 which show students' pre- and post-test scores in computational thinking skills. The article also does not provide an adequate explanation of how the results of this study can be related to other related theories or research. In addition, the article also has some writing and grammatical errors that may interfere with the reader's understanding. For example, there are some sentences that sound unnatural or unclear in English usage (e.g. "Let's make Roti with fun coding" *activities*). Writing errors like these can reduce the communication quality of the article and make it difficult to understand. In this case, the article could be improved by providing clearer and more consistent explanations of the data and research findings, as well as making revisions to correct writing and grammatical errors.

SCORE:

- 2__ of 5

RECOMMENDATION:

How is the quality of communication as it relates to English language proficiency?

[ ] Publishable as is (Language problems are few to none)

[ ] Minor Proofing Required (Content should be proofread by a colleague or critical friend of the author)

[Y] Professional Editing Required (English language errors are significant and detract from the overall quality of the article)

Our publishing model is intended to ensure that authors speaking English as a second language are given the equal opportunity to receive feedback from a peer-review process to critique and improve the conceptual material of their article. Some articles can be well researched and formulated but may require assistance with certain nuances of the English language.

Journal Title
ISSN: ####-#### (Print), ISSN: ####-#### (Online)
Volume #, Issue #, 20##
https://doi.org/#####################

The Effects of Using Unplugged Coding Activities Based on Local Integration to Foster Teachers' Learning Management and Students' Computational Thinking Skills in Thailand

REDACTED

Received: 11/11/1111; ***Accepted:*** 11/11/1111; ***Published:*** 11/11/1111

Abstract: In the 21st century, computational thinking (CT) is a problem-solving technique that has become essential for learners. However, many school teachers still face learning management challenges when introducing CT concepts to young students. Hence, this study developed and applied unplugged coding activities based on local integration, delivered as game-based learning activities. These learning activities aim to introduce elementary students to basic coding concepts and CT processes. The purposes of the study are 1) to design and develop unplugged coding activities with local integration, 2) to study the effects of potential development of teachers' learning management by training them with unplugged coding activities based on local integration, and 3) to study the effects of students' CT skills by using unplugged coding activities based on local integration. The unplugged coding activities were implemented using 1) a post-intervention design with 31 computing science teacher participants at the elementary level getting involved and 2) a pre-and post-intervention design with 33 elementary student participants participating. Based on the statistical analyses, teachers' learning management performance and students' understanding of CT concepts increased significantly after using the unplugged coding activities. The implications of this research were also suggested and discussed in this paper.

Keywords: *Unplugged Coding, Local Integration, Learning Management, Computational thinking*

Introduction

Computational thinking (CT) is an essential skill for students in the 21st century. It is now necessary not only because it helps learners understand computer science concepts but also helps them solve problems on a daily basis. CT is commonly regarded to be a mental process involving the formulation of issues and their solutions in a form that can be effectively implemented by computational procedures and algorithms (Wing 2006). This broad applicability of CT skills has recently prompted numerous modifications and reforms to educational curricula. Many governments and educational institutions worldwide have taken an interest in CT and sought to incorporate it into their curriculum subjects at various levels, including primary, secondary, and higher education (Namli and Aybek 2022). This enormous interest has been observed in several countries, including the USA, the UK, New Zealand, Germany, India, Georgia, France, Korea, Japan, Sweden, Finland, Israel, Russia, and Italy; as a result, the education ministries in those nations have included computer science in their national curricula (Threekunprapa and Yasri 2020). In Thailand, where this study focused, the computing science subject has been used since 2018 by the Institute for the Promotion of Teaching Science and Technology (IPST). As an autonomous agency, IPST has been authorized by the Ministry of Education Thailand to take responsibility for establishing and enhancing the national curriculum for technology education at the basic education level. One of the primary goals of the education technology enhancement is to help Thai students solve

complex problems by using CT concepts (The Institute for the Promotion of Teaching Science and Technology 2018).

However, as we observed in the Thailand context, there are some limitations when it comes to including CT concepts in education programs. First, CT concepts rely on computer devices and internet access, which means they are inapplicable to certain schools that lack sufficient IT equipment, particularly those in disadvantaged areas. Second, text-based programming is relatively passive, meaning it may not support students in enhancing their learning motivation, resulting in unsatisfactory learning outcomes (Threekunprapa and Yasri 2020). Due to these restrictions, unplugged coding is one approach that has become popular in the past few years to counteract the problems. The method enables educators to teach computer science fundamentals without using real computers or other digital information processors. In other words, educators utilizing unplugged coding are not required to rely primarily on power, a computer, Internet connectivity, or other similar technological instruments, and they may adapt their training to nearly any scenario. In addition, gaming and entertainment components might be an excellent way to boost students' learning motivation and emphasize hands-on practice (Sendurur 2019; Chookhampaeng, Kamha and Chookhampaeng 2023).

Therefore, considering that the schools that we observed are in one of the most disadvantaged areas where IT equipment and internet access were insufficient and where we consider CT skills are essential for students, we designed and developed unplugged coding activities based on local integration to fill such identified gaps. The activities required no digital devices and were designed as game-based learning with local cultural contexts of students and teachers included.

The purposes of this study were 1) to design and develop unplugged coding learning activities with local integration based on an appropriate related theoretical framework; 2) to study the effects of potential development of teachers' learning management by training with unplugged coding activities based on local integration; 3) to study the effects of students' CT skills by using unplugged coding activities based on local integration. Considering the above, the following are the research questions used to guide this study:

1. Do the developed unplugged coding activities have the effectiveness based on a criterion of equivalents?

2. What is the mean score potential achievement of teachers in learning management with unplugged coding activities based on local integration?

3. What is the mean score achievement of students in CT skills?

Theoretical Background

Computational Thinking Skills

CT can provide a superior solution in both the classroom and the actual world. Different researchers have termed several definitions of CT. CT is broadly defined across all definitions as the foundation for evaluating and analyzing several methods and creatively addressing problems through critical thinking (Tan et al. 2021). One of the definitions of problem-solving skills under the CT is the process of conceptualizing a problem and presenting

its solutions in a way that a computer-human or machine can effectively implement (Wing 2017). In other words, CT refers to the thought process and the way of solving a problem that allows students to solve that problem with a computer. However, some educators warned us that CT should not be understood as one single skill. The International Society for Technology in Education (ISTE) includes the skills of decomposition, gathering and analyzing data, abstraction, and algorithm design within the CT category (ISTE 2016). Furthermore, Lee, Joswick and Pole (2023) concurred that CT is best conceptualized as
an umbrella for decomposition, abstraction, pattern recognition, and algorithm design. According to The Institute for the Promotion of Teaching Science and Technology in Thailand (2018), four core components of computational thinking in computing science teacher guidebook are identified as follows:

1. Decomposition is the process of dividing a complex problem or system into more manageable and understandable components. Due to the fact that the smaller components are less complicated to work with, one may then investigate, solve, or develop each one separately.

2. Pattern recognition is the observation of patterns and trends in data and concluding it. It involves finding the similarities or patterns in and among the problems.

3. Abstraction; in the context of CT, is filtering which things you want to work on and which are irrelevant. It is a method for making issues or systems easier to comprehend, and it consists of hiding detail and eliminating needless complexity.

4. Algorithm design is the culmination of computational thought. Algorithm design is a method for developing a set of step-by-step instructions, a solution to a problem, or the rules to follow to solve a problem.

Unplugged Coding Activities

Unplugged coding is a recently created educational strategy to engage students in learning Computer Science fundamentals without using digital gadgets and internet connections. It actively engages students and fosters favorable attitudes toward learning computer science. It is also considered a practical beginning point for training students for further programming since its emphasis on the algorithm is fundamental to CT and a prerequisite for more advanced computer programming (Arinchaya and Pratchayapong 2020). The distinguishing characteristics of unplugged activities do not depend on computers, which helps avoid confusing computer science with programming or learning application software. Additionally, unplugged activities include physical experiences as part of computer education. For example, the parity card trick exploits the same error-correction process as computer memory. Unplugged coding introduces essential ideas in computer science, encompassing algorithms, artificial intelligence, graphics, information theory, human-computer interfaces, and programming languages. These activities are generally designed to be fun and engaging for students, fostering teamwork and enhancing their learning experience. Moreover, they are inexpensive and utilize typical classroom and stationery store supplies. To ensure relevance to local cultures, educators should adapt the activities based on their local context and involve local teachers. It is advised to modify the activities to align with meaningful aspects of the local culture. While competition can be helpful, having children work together is an excellent method for them to gain problem-solving skills. These activities are robust in the face of student faults; they do not rely on the precise execution of numerous complex procedures, and

slight errors should not prevent participants from grasping the underlying principles (Computer Science Education 2022).

Learning with Local Culture Integration

As indicated above, learning activities should be relevant to students' local cultures and backgrounds. Relationships, official and informal routines, and rituals are characteristics of the school's culture. Five culture design concepts ensure the quality of competency-based systems (Lopez, Patrick and Sturgis 2017):

1. Equity is based on the concept that justice means that individual obtains what they need to succeed, as opposed to being identical to everyone else. Therefore, schools with an equitable culture must give instructors a chance to get to know their pupils and the flexibility to respond to them. A culture of equity incorporates explicit cultural responsiveness and universal learning design ideas into its teaching principles.

2. Students must feel physically and emotionally safe to be receptive to learning to foster a culture of learning and inclusion. Safety and confidence are conditions for risk-taking, which is essential for fruitful conflicts. Moreover, a culture of learning tries to assist students in becoming self-aware, successful learners so that they are empowered as lifelong learners. A culture of inclusivity fosters the notion that all students have a place in a learning community.

3. Quality necessitates intention, and intention necessitates that schools have a distinct mission and design. An influential culture frequently allows students to connect their learning to their present and future lives.

4. A school requires a culture of adaptable leadership that empowers others to generate the flexibility and responsiveness necessary to personalize learning and meet the changing needs of students.

5. A society with a growth mindset holds that intelligence is flexible, anticipates failure, and uses it to further learning.

Previous Studies

The unplugged coding approach is widely used as a tool in teaching CS at the K-12 level for CT skills, as mentioned in various research papers from many countries.

First, the study by Sun, Hu and Zhou (2021) has devised and conducted unplugged coding activities. The researchers conducted a quasi-experimental study in China to determine the efficacy of unplugged activities on the CT skills of junior high school students and to determine the influence of different variables. Based on intra-group and inter-group comparison results, the study demonstrated that unplugged coding was an effective technique to improve the CT skills of seventh-graders. In unplugged coding exercises, however, the effect was not observed. Therefore, in the present environment, it is obvious that unplugged coding exercises are an efficient technique for junior high school students to enhance and expand their IT abilities.

Olmo-Muñoz, Cózar-Gutiérrez and González-Calero (2020) also conducted another investigation. Additionally, the researchers devised and conducted unplugged activities for

pupils in Spain. Their research aimed to build students' computer technology (CT) abilities and motivation toward the proposed teaching, as well as to determine whether students' gender influenced the development of their CT skills and enthusiasm to learn.
The intervention consisted of two phases and was based on a selection of activities extracted from Code.org courses. Initially, there were two groups: one working on unplugged activities and the other on plugged-in ones. Each group participated in plugged-in activities during the second phase. Analyzing the three proposed questions using pre-, during-, and post-instruction testing, the researchers concluded that including unplugged activities in the teaching was advantageous to students' CT skills development and motivation, with gender playing a role.

The third important contribution was Sendurur's study. The researcher studied the CS-Unplugged activity creation skills of pre-service computer teachers in Turkey. According to the findings of the study, pre-service teachers could not design CS-Unplugged activities. They failed to establish the necessary rationales and resulting context for the activities in a clear manner. However, participants indicated that story and game frameworks could improve their activities in terms of student motivation and retention, despite the fact that their activities typically lacked such patterns. In addition, many physical objects were incorporated into the exercises along with the necessary connections to programming ideas. These activities were deemed simple to execute (Sendurur 2019).

Kircali and Ozdener (2022) conducted another fascinating investigation. The researchers evaluated the effects of plugged and unplugged programming tools used in K-12 algorithm instruction on the CT skills of students in Turkey. They determined if gender has a role in this procedure. The study group was designed using a quasi-experimental pre- and post-test for the control group. The data revealed that the group that was instructed in unplugged activities showed a considerable increase in their CT skills, while the other groups showed no significant change. Also, the groups discovered no statistically significant differences when comparing CT skills. It was noted that group and gender cofactors did not provide significant variance between groups. When differences were studied group-by-group, they favored male students conducting unplugged activities.

As stated, several studies have reported positively on using unplugged coding activities for both students and teachers. However, they did not show in their research how to design and apply local cultures and students' backgrounds to their learning activities. Thus, this paper investigates the effects of unplugged coding activities that integrate localization to promote both teachers' learning management performance. Finally, we verified the effectiveness of the developed unplugged coding activities in improving the CT of elementary school students.

Methodology

This study used a quasi-experimental research design to investigate the effect of using unplugged coding activities to foster teachers' potential development of learning management performance. The study also focused on the integration of localization into unplugged coding activities. This means that the content of the activities was tailored to students' cultural backgrounds. This strategy incorporates cultural themes into the activities to increase students' CT level in the local context where they understand. A topic of relevance is used as

a strategy in Thailand and worldwide. The methods are described in detail in the following section.

Research Framework

This framework presented the relevant theoretical aspects of the study to make research findings more meaningful (see Figure 1).

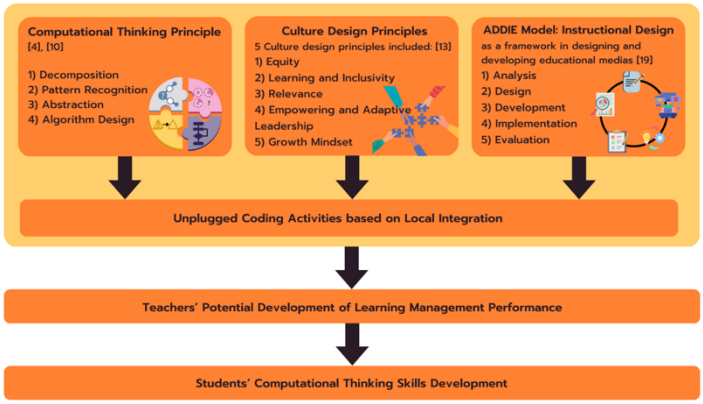


Figure 1: Research Framework

Participants

Participants in the study were natives of Yala Province, one of the southernmost provinces of Thailand and considered to be one of the disadvantaged areas of the country. This southernmost region has a Muslim population of approximately 81.46 percent, and their local culture was influenced by Malaysian culture (Community Development Office Muang Yala 2019). The participants comprised 31 computing science teachers at the elementary level between the ages of 24-51 (18 women and 13 men). The experimental classroom had 33 students (11 girls, 22 boys) who were 7 to 8-year-old at the 2nd-grade level.

Instruments and Data Collection

To investigate teachers' learning management and students' CT Skills, researchers collected data at three key points listed in Table 1.

Table 1: A Description of Each Activity and Data Collected for the Study

Research Activity	*Instrument*	*Data Collection*
1) The researchers designed and developed unplugged coding activities into which local knowledge was integrated.	The "Let's make roti with fun coding" activities were developed and then tested for their effectiveness based on a criterion of equivalents to 75/75.	The developed unplugged coding activities were pilot-tested with individual testing, group testing and field testing before being used with participants.

2) 31 teacher participants received training in the developed unplugged coding activities for developing their potential for CT learning management.	*The potential assessment form of teachers to promote learning management skills in accordance with the CT principles through unplugged coding learning activities with localization-based knowledge integration. The content validity of the test was determined to be at an average of 0.98.*	*During a 14-hour training, the teacher participants were assessed by three experts, who specialized in computer science teaching.*
3) 33 student participants learned CT through the developed unplugged coding activities.	*The pre- and post-tests of students' computer technology (CT) skills were evaluated by three specialists in computer science education. All items conform to their intended purposes, proving the legitimacy of the test's content. The average validity of the test was determined to be 1.00.*	*Participants were instructed in the unplugged coding tasks for six weeks, one hour every day. Students were given a CT achievement pre-test. Students were then requested to take a post-learning CT achievement test.*

Data Analysis

Data analysis aiming to answer the research questions was explained as follows: The criterion of E1/E2 with an equivalent of 75/75 to identify the efficiency of the unplugged coding activities based on local integration was used. Descriptive statistics, including mean and standard deviation, was used to describe teachers' learning management performance from the training activity. A dependent samples t-test was performed to compare the mean CT scores of students before and after learning the unplugged coding tasks. The purpose of
the test was to assess whether or not the post-test mean score differs significantly from the pre-test mean score. Students' CT skills development was compared to a standard score of 60 percent using a one sample t-test to see whether the mean score of each CT skill practice demonstrates statistical significance that is lower or greater than the objective criterion.

Findings

Unplugged Coding Activities “Let’s make Roti with fun Coding”

The series of unplugged coding activities, "Let's make roti with fun coding", were based on the CT approach. The content was designed to incorporate into students' cultural backgrounds and the current basic education core curriculum of Thailand BE. 2551
(AD. 2008), which revised BE. 2560 (AD. 2017) (The Institute for the Promotion of Teaching Science and Technology of Thailand 2018). Below is 'the student mission description’ Table, which has six sub-activities (see Table 2).

Table 2: Mission Description

Activity	*Worksheet*	*Short description*	*CT concept*
Mission 1: Help Abang deliver Roti		The student must design a route map into the tables by using the prescribed arrow symbols to decode from the accurate route to the destination.	Algorithm Design; 1) basic programming design with symbols 2) testing and debugging

Table 2: Mission Description (cont.)

Activity	*Worksheet*	*Short description*	*CT concept*
Mission 2: Abang is not here, I do it myself		The student is informed to help Abang make Roti as prescribed an order.	Algorithm Design; problem-solving with condition statement
Mission 3: Let's act like Abang and make Roti, shall we?		The student is informed to help Abang make Roti as prescribed an order.	Decomposition

Mission 5: How to tell your friends about your Roti idea?		The student is asked to conclude a type of Roti as his/her designed and then explain to the friends.	Abstraction

Table 2: Mission Description (cont.)

Mission 6: We can do this!		The student is assigned to make his/her own Roti following the steps from the flowchart.	Algorithm Design; Programing using flowchart

Addressing research question one, “Do the developed unplugged coding activities have effectiveness based on a criterion of equivalents?”, the results of the three tryout stages showed the effectiveness of the developed unplugged coding to meet the set criterion as specified for E1/E2. This can be seen in Table 3.

Table 3: The Efficiency of the Developed Unplugged Coding Activities

Pilot-test	*N*	*Set criterion (E1/E2)*	*Average Scores (E1/E2)*	*Effectiveness*
Individual Testing	3	75/75	75.11/75.20	Higher than the set criterion
Group Testing	9	75/75	75.60/75.48	Higher than the set criterion
Field Testing	28	75/75	76.80/77.12	Higher than the set criterion

Teachers’ Learning Management Performance

During the data collection phase of the teacher training, the teacher participants' activity worksheets and presentations were assessed by three experts specializing in computer science teaching. In the first activity, “Let us make Roti with fun coding”, the teachers solved problems from the proposed activities. At the second activity of the meeting, this activity gave them many ideas, including ways to design and develop unplugged coding activities that could integrate local knowledge into the activities based on CT principles. Moreover, by helping

them design the activity, they could better measure students' learning from their invented activities through group work and discussion.

Moreover, the second research question that asked, "What is the mean score potential achievement of teachers in learning management with unplugged coding activities based on local integration?" was answered by the study's results shown in Table 4.

Table 4: Teachers' Learning Management Performance Score

Criteria	*Mean*	*S.D.*
"Let's make Roti with fun coding" activities		
1. Analysis of the activity "Let's make Roti with fun coding" according to computational thinking principles		
1.1 Activity "Help Abang deliver Roti"	4.42	0.48
1.2 Activity "Abang is not here, I do it myself"	4.48	0.80
1.3 Activity "Let's act like Abang and make Roti, shall we?"	4.51	0.56
1.4 Activity "Whose new Roti is more likable?"	4.56	0.49
1.5 Activity "How to tell your friends about your Roti idea?"	4.32	0.70
1.6 Activity "We can do this!"	4.54	0.50
2. Analysis of the activity "Let's make Roti with fun coding" according to the Thailand basic education core curriculum BE. 2551 (AD. 2008), which revised BE. 2560 (AD. 2017) in technology (Computing Science) Grade 2		
2.1 The linkage analysis of basic education core curriculum and school curriculum	4.35	0.70
2.2 The linkage analysis of learning standards and indicators	4.48	0.57
2.3 The linkage analysis of the course descriptions	4.50	0.42
2.4 The linkage analysis of computational thinking principles	3.98	0.66
Average	**4.41**	**0.58**
Creating unplugged coding activities		
3. Designing of unplugged coding activities that integrate localization to promote learning management skills based on computational thinking principles		
3.1 The linkage analysis of the Basic Core curriculum and school curriculum	4.13	0.58
3.2 The linkage analysis of learning standards, indicators, and course descriptions	4.36	0.47
3.3 Setting activities according to the structure of the class time	4.54	0.50
3.4 The content of activities and learning order are consistent with computational thinking principles	4.27	0.80

3.5 Setting student-centered learning activities	4.51	0.76
3.6 Designing activities that are consistent with the local context	4.67	0.45
4. Developing of unplugged coding activities that integrate localization to promote learning management skills based on computational thinking principles		
4.1 The media, materials, and equipment are appropriate according to the age of the students	4.52	0.57

Table 4: Teachers' Learning Management Performance Score (cont.)

Criteria	*Mean*	*S.D.*
4.2 Innovations suited to the content and activities	4.25	0.66
4.3 Variety of media used in the innovations	4.13	0.81
5. Learning measurement and evaluation by using unplugged coding activities that integrates localization to promote learning management skills based on computational thinking principles		
5.1 Designing various learning measurement and evaluation methods	3.77	0.47
5.2 Assessment of student learning is covered by learning standards, indicators, and course descriptions	4.24	0.48
5.3 Assessment of student learning is covered in accordance with computational thinking principles	3.87	0.58
Average	**4.41**	**0.58**
Total Average	**4.34**	**0.59**

Table 4 reported that the teacher participants' mean scores of learning management performance after a training course for computer science teachers in elementary school were at high levels (mean=4.34, S.D.=0.59). The lowest mean score among the teacher participants was in the item 'Designing various learning measurement and evaluation methods' at a moderate level (mean=3.77, S.D.=0.47). The invented activities through group work and discussion were depicted in Figure 2.


Figure 2: Teachers Participants did Group Work and Discussion

Students' Computational Thinking Skills Development

The third question, "What is the mean score achievement of students in CT skills?" is answered by the study's results on the students' CT mean scores shown in Table 5 and Table 6.

Table 5: Pre- and Post-test Scores of the Experimental Students on CT Skills

	Score of experimental group (n=30)		*t*	*p*
	Pretest	*Posttest*		
Computational thinking	8.82 (2.00)	15.91 (1.99)	24.46*	.00

*P<0.05

There was a statistically significant increase in the post-test (mean=15.91, S.D.=1.99) compared to the pretest (mean=8.82, S.D.=2.00). These results showed the student improved their CT Skills after learning with the invented unplugged coding activities and a significant difference in CT skills conditions (t=-24.46, p=.000). Furthermore, one sample t-test was used to compare students' mean scores of each CT skill practice with a target criterion of 60% (6 scores). The results are reported in Table 6.

Table 6: Scores of Four Sub-dimensions of CT Skills

CT Skills	*N*	*Scores*	*Percentage 60*	*Mean*	*S.D.*	*t*	*p*
Decomposition	33	10	6	7.15	1.28	5.18*	.00
Pattern Recognition		10	6	7.97	1.10	10.25*	.00
Abstraction		10	6	7.76	0.94	10.78*	.00
Algorithm Design		10	6	8.12	0.99	12.28*	.00

*P<0.05

As seen in Table 6, it was statistically significant in all four sub-dimensions mean scores. Specifically, the mean score of Algorithm Design was the highest among the sub-contents of CT Skills (mean=8.12, S.D.=0.99). The example of student' s performance in the unplugged

coding activities is illustrated in Figure 3, and the scores of the experimental group showed improvement across four sub-dimensions of CT skills in Figure 4.

Figure 3: The example of student' s performance in the unplugged coding activities

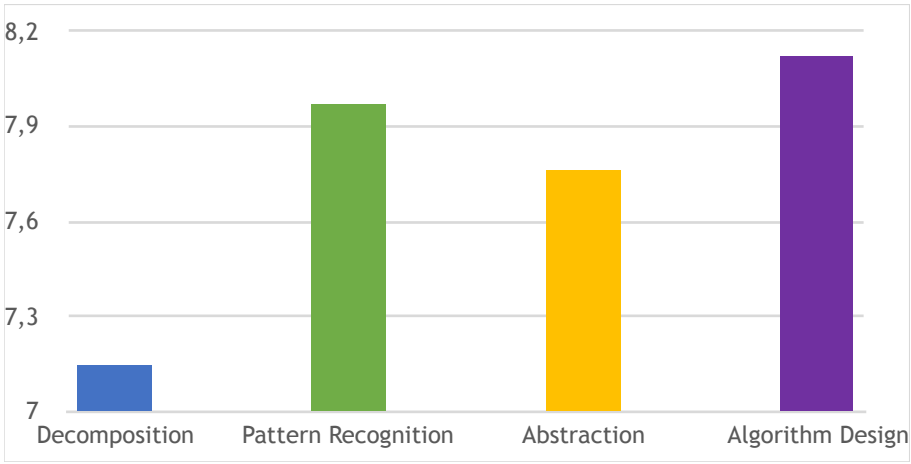


Figure 4: The experimental group demonstrated improved scores across four sub-dimensions of CT skills.

Discussion and Conclusion

This study designed unplugged coding activities which integrated the local cultures and students' backgrounds to accommodate participants' cultural familiarities. Regarding the research questions, the first question investigated the effectiveness of the developed unplugged coding activities, and the results showed the effectiveness of the developed unplugged coding in meeting the set criterion as specified. According to the purpose of education, it must be rooted in the lives of students and their familiarity. To achieve this objective, it is necessary to understand the students' life goals. A familiar cultural environment enables regular opportunities for local students to make connections between their present and future lives during the learning process (Lopez, Patrick and Sturgis 2017; Phadung, Dermrach and Rattanachai 2020). Moreover, this study employed the unplugged coding strategy as game-based learning to involve students in the learning process and make the task more engaging and challenging (Threekunprapa and Yasri 2020).

Regarding the second research question, the mean score of the teachers' potential achievement in learning management with unplugged coding activities was based on local integration. According to the results obtained, the mean score was at high levels. Nevertheless, the finding indicated that the item 'designing various learning measurement and evaluation methods' was moderate. The research suggests that teacher training should focus on increasing their learning measurement and evaluation techniques. Through adequate training, teachers could acquire strategies to use various measurements from an educational perspective and guide students toward acquiring CT skills (Chookhampaeng, Kamha and Chookhampaeng 2023).

The last research question concerned the mean score achievement of students in CT skills. Based on the results, there were significant differences between pre-posttest interventions, and the posttest obtained a significantly higher score than the pretest. These data were in line with similar research, especially the ones related to CT skills (Sun, Hu and Zhou 2021; Olmo-Muñoz, Cózar-Gutiérrez and González-Calero 2020; Relkin, de Ruiter and Bers 2021).

Regarding each sub-dimension of CT skills practice, the finding revealed a statistical significance in all four sub-dimensions mean scores. This could be especially seen in the mean score of Algorithm Design, which was shown to be the highest among the sub-dimensions of CT Skills. This way, the programming algorithm design ability can increase, and elementary school students can start programming with more positive perspectives (Türker and Pala, 2020).

This study developed and applied the unplugged coding activities based on local cultures and students' backgrounds as "Let's make Roti with fun coding". The training course was designed to train computing science teachers at the elementary level with a focus on the development of learning management performance. In the beginning, the teachers did workshops on the activities which researchers invented. At the end of the workshop, they were assigned to design and develop their own unplugged coding activities with local integration. After training, the results have shown that the teachers have developed the potential of their learning management which was seen at a satisfactory level; however, the results showed that designing various learning measurement and evaluation methods should be considered. In addition, this study examined the development of CT abilities in second-grade students who participated in unplugged activities. The results revealed that the unplugged activities intervention effectively and significantly improved the students' technology skills.

The light of all the findings, it can be suggested that CT is a fundamental aspect of the 21st century and unplugged coding activities with local integration were found to be practical and have positive effects on the CT skills of students in the local context. For future study, unplugged coding activities should be broadened, and implementation results should be studied from various angles with more extended implementation periods for various grade levels to demonstrate more concrete results.

Acknowledgment

The researchers would like to acknowledge the generous support provided by Yala Rajabhat University through research grants in 2022, which contributed to the completion of this study.

Informed Consent

The author has obtained informed consent from all participants.

Conflict of Interest

The author declares that there is no conflict of interest.

REFERENCES

Chookhampaeng, Chowwalit, Kamha, Chantraporn and Chookhampaeng, Sumalee. 2023. "Problems and Needs Assessment to Learning Management of Computational Thinking of Teachers at the Lower Secondary Level." Journal of Curriculum and Teaching 12(3): 172-178. https://doi.org/10.5430/jct.v12n3p172

Community Development Office Muang Yala. 2019. *Yala People Quality Report 2019*. Yala: Community Development Office Muang Yala.

Computer Science Education, University of Canterbury. 2022. "CS Unplugged Principles." Accessed June 20, 2022. https://www.csunplugged.org/en/principles/

ISTE: International Society for Technology in Education. 2016. "ISTE National Educational Technology Standards (NETS)." Accessed June 20, 2022. https://www.iste.org/iste-standards.

Kirçali, Aycan Çelik and Özdener, Nesrin. 2022. "Comparison of Plugged and Unplugged Tools in Teaching Algorithms at the K-12 Level for Computational Thinking Skills." *Technology, Knowledge and Learning*. https://doi.org/10.1007/s10758-021-09585-4

Lee, Joohi, Joswick, Candace and Pole, Kathryn. 2023. "Classroom Play and Activities to Support Computational Thinking Development in Early Childhood." *Early Childhood Education Journal* 51: 457-468. https://doi.org/10.1007/s10643-022-01319-0

Lopez, Nina, Patrick, Susan and Sturgis, Chris. 2017. "Quality and Equity by Design: Charting the Course for the Next Phase of Competency-Based Education, iNACOL." Accessed June 20, 2022. http://www.aurora-institute.org/wp-content/uploads/CompetencyWorksQuality And EquityByDesign.pdf

Namli, Nihan Arslan and Aybek, Birsel. 2022. "An Investigation of The Effect of Block-Based Programming and Unplugged Coding Activities on Fifth Graders' Computational Thinking Skills, Self-Efficacy and Academic Performance." *Contemporary Educational Technology* 14(1). https://doi.org/10.30935/cedtech/11477

Olmo-Muñoz, Javier del, Cózar-Gutiérrez, Ramón and González-Calero, José Antonio. 2020. "Computational thinking through unplugged activities in early years of Primary Education." *Computers & Education* 150: 1-19. https://doi.org/10.1016/j.compedu.2020.103832

Phadung, Muneeroh, Dermrach, Praewsree and Rattanachai, Nantana. 2020. "A Design and Effects of a Mobile App for Language Learning: Stakeholder Perspectives." *Journal of Advanced Research in Dynamical and Control Systems, 12*(3): 547-553.

Relkin, Emily, de Ruiter, Laura and Bers, Marina. 2021. "Learning to Code and the Acquisition of Computational Thinking by Young Children." *Computers & Education* 169: 1-15. https://doi.org/10.1016/j.compedu.2021.104222

Sendurur, Polat. 2019. "Investigation of pre-service computer science Teachers' CS-unplugged design practices." *Education and Information Technologies, 24:* 3823–3840.

https://doi.org/10.1007/s10639-019-09964-6

Sun, Lihui, Hu, Linlin and Zhou, Danhua. 2021. "Improving 7th-graders' computational thinking skills through unplugged programming activities: A study on the influence of multiple factors." *Thinking Skills and Creativity* 42: 1-15. https://doi.org/10.1016/ j.tsc. 2021. 100926

Tan, Wee-Ling, Samsudin, Mohd Ali, Ismail, Mohd Erfy, Ahmad, Nur Jahan and Abdul Talib, Corrienna. 2021. Exploring the Effectiveness of STEAM Integrated Approach via Scratch on Computational Thinking. *EURASIA Journal of Mathematics, Science and Technology Education 17*(12): 1-19. https://doi.org/10.29333/ejmste/11403

Threekunprapa Arinchaya, and Yasri, Pratchayapong. 2020. "Unplugged Coding Using Flowblocks for Promoting Computational Thinking and Programming among Secondary School Students." *International Journal of Instruction 13*(3): 207–222. https:// doi.org/10.29333/iji.2020.13314a.

The Institute for the Promotion of Teaching Science and Technology. 2018. *Computing science teacher guide*, Bangkok: The Institute for the Promotion of Teaching Science and Technology, Thailand.

Türker, Pınar Mıhcı, and Pala, Ferhat Kadir. 2020. "The Effect of Algorithm Education on Students' Computer Programming Self-Efficacy Perceptions and Computational Thinking Skills." *International Journal of Computer Science Education in Schools* 3(3). https:// ijcses.org/index.php/ijcses/article/view/69/69

Wing, Jeannette Marie. 2006. "Computational thinking." *Communication of the ACM* 49(3): 33-35.

Wing, Jeannette Marie. 2017. "Computational thinking's influence on research and education for all." *Italian Journal of Educational Technology* 25(2): 7-14.

ABOUT THE AUTHORS

REDACTED