Socialization of Unplugged Coding Media Creation

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Abstract

Coding represents an introduction to the fundamental principles of programming and logical reasoning, which can be delivered through enjoyable and interactive activities. Introducing coding at an early age is essential, as it enables children to develop logical thinking, creativity, and basic problem-solving skills from a young age. The introduction of coding for children does not necessarily require the use of technology; it can be facilitated through unplugged coding learning media. Therefore, this community service activity aimed to provide socialization and training for kindergarten teachers and parents on the development of unplugged coding media. Through this program, it is expected that teachers and parents will be able to introduce coding concepts to children in an engaging and enjoyable manner. The community service activities were carried out through socialization sessions and hands-on practice with kindergarten teachers and parents. The program consisted of three main stages: introduction to unplugged coding media, development of unplugged coding media, and implementation of unplugged coding media. Four types of unplugged coding media were introduced, namely: Lateral Puzzle Board, Apple Garden Media, Safari Map Media, and Coding Direction Cards. This community service program was conducted at An-Shal Kindergarten, located in Kamal District. Pre-tests and post-tests were administered to participants before and after the socialization activities to measure the improvement in their knowledge. The results of the pre-test and post-test indicated that the socialization of unplugged coding media significantly enhanced teachers' understanding and ability to develop unplugged coding media for early childhood education.

Keywords: unplugged coding, lateral puzzle board, apple garden media, safari map media, coding direction cards

1. Introduction

The rapid advancement of technology has precipitated considerable changes in the classroom learning process. Consequently, the government is placing greater demands on school teachers. The government has expressed its desire for teachers to deliver lessons and incorporate technology in accordance with current developments [1]. One key demand is that teachers must incorporate coding into the curriculum at an early stage.

Coding is a fundamental aspect of learning that must be mastered at an early stage, as it fosters the development of critical thinking skills that are essential for problem-solving and innovation [2]. The dissemination of coding education to children can be initiated from a very early age, utilising straightforward learning materials. A simple learning medium for teaching coding is unplugged coding. The government's policy of integrating coding education at an early stage in the educational curriculum is not merely a response

to prevailing trends; research findings indicate that the implementation of coding education will contribute to enhancing students' digital literacy skills, a domain in which Indonesia has acknowledged the need for improvement [3].

Unplugged coding is considered a medium that can be used during the coding learning process in a landscape form, which makes it possible for children, especially young children, to learn coding without using software and hardware on a computer [4]. A plethora of unplugged coding media is available for pedagogical use in schools, including lateral puzzle boards, apple gardens, safari maps and coding direction cards. The four types of media under discussion are all relatively simple to create and utilise with children. However, upon conducting our preliminary observation by visiting the school and conducting interviews with teaching staff at An-Shal Kindergarten, it became apparent that none of the respondents were acquainted with these four media. Teachers frequently introduce coding to children without the use of media, which results in a protracted learning process due to the

children's continued difficulty in comprehending the material.

Following the identification of issues during the preliminary observation phase at the educational facility, a consensus was reached to organize a community service initiative centring on the dissemination of unplugged coding media creation. The objective of this service program was to disseminate knowledge to educators on the creation and implementation of unplugged coding media for children. Furthermore, the utilization of unplugged coding media, conceptualized by pedagogues themselves, has been demonstrated to facilitate children's computational thinking, rendering it highly pertinent to future developmental requirements [5].

The findings of the research conducted by Nurfia et al. demonstrate that the utilisation of unplugged coding media exerts a substantial influence on the computational thinking skills of children [6]. It has been demonstrated that children who are trained using unplugged coding media find it easier to understand coding concepts before learning coding using computers. The utilisation of unplugged coding media has been demonstrated to be efficacious not only during the learning process, but also in the context of extracurricular coding activities at school [7].

The application of unplugged coding media, apart from being a medium for training children's thinking, has also been proven to strengthen children's problem-solving skills at an early age [8]. This shows that the use of unplugged coding media is very suitable for children, so that they will become accustomed to facing problems in accordance with their developing thought patterns. Children who are accustomed to solving problems independently based on direct experience from the learning process will have better thinking patterns than children who only receive knowledge transfer from their teachers.

The role of educators in this regard is twofold: firstly, to create unplugged coding media, and secondly, to provide students with hands-on experience that is closely related to children's daily activities. Research conducted by Qonitah et al. demonstrates that unplugged coding practices, grounded in daily life experiences, can enhance the computational thinking skills of early childhood [9]. Moreover, unplugged coding has been demonstrated to be efficacious in the training of children's literacy skills [10].

In light of the issues identified, the present study is guided by the following research problem formulation:

a. To what extent do early childhood educators understand the concept and pedagogical importance of unplugged coding in early childhood learning?

b. How can the training on the development and use of unplugged coding media enhance teachers' abilities to design and implement appropriate instructional materials?

c. How effective are the four types of unplugged coding media—lateral puzzle boards, apple gardens, safari maps, and coding direction cards—in supporting the introduction of coding concepts to young children?

The objective of this community service programme is twofold: firstly, to introduce participants to the concept of unplugged coding media, and secondly, to provide them with the opportunity to practise its creation and utilisation in the context of coding lessons. The unplugged coding media that will be utilised in this study include lateral puzzle boards, apple garden media, safari map media, and coding direction cards. Lateral puzzle boards represent a category of learning media that has been demonstrated to engender a positive association with the learning process, thereby fostering motivation in students [11]. The apple garden constitutes an alternate coding medium that can also enhance the development of early childhood thinking patterns [12]. Meanwhile, research conducted by Merve and Hasan has indicated that safari maps are an effective medium for introducing unplugged coding [13]. Coding direction cards are also classified as media that are suitable for children. The ease of use of this media is the reason we chose it.

2. Metode

The implementation of this community service program employed a structured methodological approach consisting of preparation, training, practice, and evaluation stages. The primary participants in this program were six teaching staff members of An-Shal Kindergarten, comprising classroom teachers responsible for early childhood groups (Playgroup, Kindergarten A, and Kindergarten B), as well as supporting teachers who assist in daily learning activities. These participants were selected based on their direct instructional roles and their potential to integrate unplugged coding media into classroom practice.

The initial phase involved conducting a preliminary observation, which was carried out through an in-depth interview with the principal of An-Shal Kindergarten. This observation aimed to identify the current level of coding integration in the school and assess the teachers' familiarity with unplugged coding media. The data obtained from this stage informed the design of the subsequent training materials and activities.

Following the observational stage, a pre-test was administered to all participating teachers using the Kahoot application. The pre-test functioned as a diagnostic tool to assess participants' baseline knowledge of coding concepts and unplugged coding media prior to receiving training.

The training component of the program consisted of three structured stages:

a.Introduction to Unplugged Coding Media
Participants received a comprehensive presentation on the concept, purpose, and pedagogical importance of unplugged coding for early childhood learning. Various types of unplugged coding media—lateral puzzle boards, apple gardens, safari maps, and coding direction cards—were introduced, along with explanations of their relevance to developing computational thinking skills.

b. Demonstration and Guided Creation of Unplugged Coding Media, The second stage involved a hands-on demonstration of how each type of unplugged coding media is created. The facilitators provided direct assistance, enabling participants to design and construct their own versions of the media. This guided practice ensured that teachers were able to replicate the process independently and tailor the media to their classroom needs.

c. Application and Classroom Simulation
In the final stage, participants were invited to apply the unplugged coding media they had created in simulated classroom activities involving students at An-Shal Kindergarten. Teachers practised implementing the media while facilitators observed and provided feedback. This stage allowed teachers to experience real-time challenges and refine their instructional strategies based on practical application.

Upon completion of the practical session, teachers participated in a post-test, again administered through the Kahoot application. The post-test served as an evaluative instrument to measure improvements in teachers' understanding and to determine the effectiveness of the community service program. Additionally, observations were recorded regarding teachers' performance and confidence in implementing the unplugged coding media during the simulation activities.

3. Result and Discussion

The community service activities that were carried out for three consecutive days produced several results. The initial finding was that, upon the introduction of unplugged coding media in An-Shal kindergarten, it was evident that the teaching staff possessed limited knowledge in this domain. This assertion is supported by the findings of the preliminary test, which was administered via the Kahoot application. The following results are derived from a pretest administered to kindergarten teachers at An-Shal.

Table 1. The following report details the results of the pre-test of the socialization participants.

No.	Participant	Score
1	A	50
2	B	60
3	C	50
4	D	55
5	E	45
6	F	65

he pre-test results revealed that the teaching staff at An-Shal Kindergarten possessed limited prior knowledge of unplugged coding. Scores ranged from 45 to 65, indicating that teachers were unfamiliar with both the concept and practical implementation of unplugged coding as a pedagogical tool. These findings confirm the initial assumption that coding at An-Shal Kindergarten had previously been introduced only through downloadable worksheets. This approach, although practical, offered minimal engagement for young learners and did not support the development of computational thinking. The low pre-test scores thus reflect not only a lack of knowledge but also the absence of prior exposure to alternative coding media that could facilitate active learning.

Following the pre-test, participants were introduced to four types of unplugged coding media: lateral puzzle boards, apple garden media, safari maps, and coding direction cards. Rather than merely describing each medium, the workshop emphasized how these tools embody computational thinking principles such as sequencing, decomposition, and pattern recognition. The introduction session demonstrated that teachers quickly recognized the pedagogical advantages of these media, particularly their alignment with play-based learning commonly used in early childhood education.

During the creation phase, teachers were guided to design and construct their own unplugged coding media. Analysis of this stage shows that participants not only replicated the examples provided but also adapted them to fit their classroom contexts—for instance, modifying characters to reflect local themes or adjusting grid sizes to suit younger age groups. This indicates a shift from passive receivers of information to active designers of instructional tools, which aligns with findings from Qonitah et al. that teacher-generated unplugged media enhance instructional relevance and classroom usability

The implementation phase—where teachers applied the media with students—offered further evidence of the program's impact. Observations showed that students were more engaged, demonstrated better understanding of directional commands, and were able to collaborate effectively when solving sequencing tasks. Teachers also reported that the hands-on nature of unplugged media made coding concepts easier to

explain compared to worksheet-based instruction. These observations align with previous research indicating that unplugged activities contribute positively to early computational thinking development.

Lateral puzzle boards represent a medium for learning, specifically in the form of game boards that are utilised to introduce fundamental coding (programming) concepts to kindergarten children. This is achieved through the process of playing and solving problems logically. The puzzle board comprises a base board with paths, grids, or squares; puzzle pieces that represent directions or commands; and characters or objects (e.g. robots, animals, toy cars) that become "players" that are moved according to the sequence of commands. The following image depicts a lateral puzzle board.

Figure 1. Lateral Puzzle board

The second medium that was introduced to An-Shal kindergarten teachers was the apple garden medium. The Apple Garden medium is an educational game tool in the form of a garden with apple trees. It has been designed to introduce basic coding concepts to early childhood. As with the puzzle board medium, the apple garden medium is also comprised of several components. These components include a garden board, miniature apple trees, command cards and player characters. The following image depicts the apple garden medium.
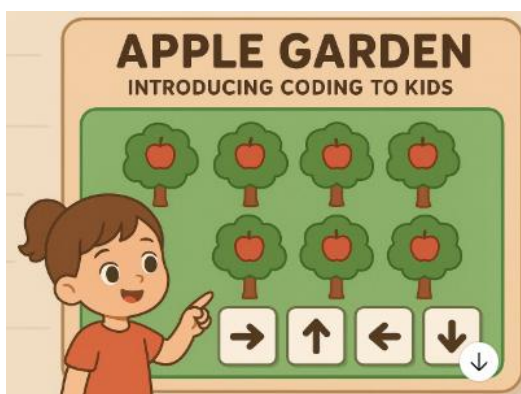

Figure 2 planting apple media

In addition to the two media previously mentioned, we also introduce other learning media that can be used to introduce coding to children in a way that is easier

and more enjoyable. One such example is safari map media. In this game, children are tasked with the arrangement of a sequence of commands, otherwise referred to as algorithms, with the objective of enabling characters such as safari cars, animals, or explorers to traverse routes on a map and reach their destination. This may involve the finding of specific animals or treasure. The following image depicts a safari map media.

Figure 3. Safari Map

The most recent unplugged coding medium that was introduced was coding direction cards. This medium comprises a series of command cards that students are required to adhere to. These cards have been developed as a means of introducing children to the concept of coding. The image below illustrates the command cards employed in the coding lessons.

Figure 4. Direction Card Media Coding

The second activity of this community service program was the creation of unplugged coding media. The creation of unplugged coding media was achieved by providing direct socialization to An-Shal kindergarten teachers on the subject of how to create unplugged coding media. The following images were captured during the socialization activity for the creation of unplugged coding media.

Figure 5 The following images depict the unplugged coding media socialization activity.

The following images depict the unplugged coding media socialization activity.

Following the socialization process with the teaching faculty, the team endeavored to implement the findings of the unplugged coding media experiment with the students. The following images depict the unplugged coding media application activity.

Figure 6 Photos of unplugged coding activities

The implementation process of unplugged coding media was the final part of our community service activities targeting An-Shal kindergarten teachers. After completing the process, we gave a post-test to the participants to determine the extent of their knowledge about unplugged coding media after the socialization process. The following are the post-test results obtained from the participants.

Tabel 2. The results of the post-test on participants in the socialisation process are presented herewith.

No.	Participant	Score
1	A	85
2	B	90
3	C	90
4	D	100
5	E	95
6	F	100

Table 2 demonstrated by the post-test results, it was evident that all participants in the socialization program had increased their knowle The increase in scores demonstrates that teachers acquired not only theoretical understanding but also practical competence in developing and applying unplugged coding media. The significance of this improvement lies in its alignment with the goals of the program—empowering teachers to design engaging coding experiences and integrate them meaningfully into early childhood learning.dge of unplugged coding media.

Based on the comparison of the average pretest and posttest scores the result obtained percentage gain 72,3% and normalized gain (Hake's g) 0,855. Interpretation (Hake's Criteria).

g Value	Category
g > 70	High Gain
0,3 – 0,7	Medium Gain
< 0,3	Low Gain

With gain 0,88 , the program produced high learning gain and demonstrating strong effectiveness. Overall, the comparison between pre-test and post-test results indicates that the community service program effectively addressed the knowledge gaps identified during preliminary observations. Moreover, the qualitative insights from observations and teacher feedback suggest that unplugged coding media offer substantial pedagogical value, particularly in fostering computational thinking and enhancing learning engagement among young children. These findings reinforce the argument that unplugged coding represents a feasible and impactful approach for early childhood education settings, particularly in institutions where access to digital devices is limited.

d. **Conclusion**

The implementation of this community service program has successfully enhanced the understanding and practical skills of early childhood educators at An-Shal Kindergarten regarding the concept, development, and application of unplugged coding media. The results of the pre-test and post-test demonstrate a substantial improvement in participants' knowledge, with an increase in the average score from 54.17 to 93.33 and a normalized gain value (g = 0.855) that falls within the high-gain

category. This indicates that the training intervention was not only effective in strengthening conceptual comprehension but also in equipping teachers with the ability to independently design and apply unplugged coding media in real classroom contexts.

In practice, teachers demonstrated increased confidence and pedagogical readiness during the classroom simulation phase, successfully integrating media such as lateral puzzle boards, apple gardens, safari maps, and coding direction cards. Observations also revealed that students responded positively to the use of these interactive learning tools, showing increased engagement and improved problem-solving behaviour. These findings affirm that unplugged coding media are highly suitable for early childhood learning and hold considerable potential in supporting the development of computational thinking from an early age.

To ensure the long-term impact and continuity of this program, several follow-up strategies are proposed:

Teacher Capacity Building (Continuous Training)
An-Shal Kindergarten will be encouraged to institutionalize periodic internal workshops to maintain and further strengthen teachers' mastery of unplugged coding techniques. Training modules created during this program will be prepared for future onboarding of new teaching staff.

Integration into the School Curriculum
The unplugged coding media developed during the program will be integrated into weekly lesson plans, particularly within numeracy, literacy, and thematic learning sessions. This ensures consistent exposure for students and sustained pedagogical implementation.

Development of a School Coding Corner (Learning Center)
A dedicated learning corner equipped with puzzle boards, safari maps, and command cards will be established to serve as a permanent instructional media station, allowing children to practise computational thinking through structured play.

Monitoring and Evaluation Mechanism
A simple monitoring system—such as teacher reflection logs, classroom observation checklists, and periodic student progress recordings—will be implemented to document the continued effectiveness of unplugged coding activities.

Collaboration and Community Outreach
Opportunities will be explored to collaborate with other early childhood institutions, local education authorities, or university partners to expand the adoption of unplugged coding media. Future PKM programs may further focus on refining instructional models or developing digital-support materials.

Scaling Up to Parental Engagement Programs
Parents can be involved through simple take-home unplugged coding activities or family coding days, strengthening school–home partnerships and reinforcing students' computational thinking skills outside the classroom.

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