RESEARCH ARTICLE

Prospective Pre-School Teachers' Views on Coding Education in Early Childhood

Mehmet Nuri Gömleksiz	Prof. Dr.
	Firat University
	Türkiye
	E-mail : ngomleksiz@firat.edu.tr; Orcid: 0000-0002-8268-0163
Zehra Al	Res. Asst.
	Hatay Mustafa Kemal University
	Türkiye
	E-mail: zehra.al@mku.edu.tr; Orcid: 0009-0000-2522-4121

Abstract

Rapidly advancing technologies have necessitated the restructuring of educational environments to equip learners with skills appropriate to the demands of the modern age. These skills have evolved over time with the addition of new competencies, bringing coding education to the forefront as a universal language. Coding education is defined as the structuring of problem-solving, system design, and human behaviour understanding processes through computer science concepts. This education finds a wide field of application not only in advanced education levels but also in the pre-school period. The quality of coding education in early childhood is directly related to the pedagogical competencies of teachers, who play a critical role in the process. Therefore, determining the views of prospective pre-school teachers on coding education in early childhood will contribute to curriculum development efforts in education and the updating of prospective teacher training curricula. This research aims to determine the views of prospective pre-school teachers on coding education in early childhood. To this end, semi-structured interviews are conducted with 20 prospective pre-school teachers studying at the Faculty of Education of a state university, and the data obtained are analysed using content analysis and divided into meaningful themes, codes, and categories. As a result of the research, various recommendations are made based on the views of prospective pre-school teachers regarding coding education in early childhood.

Introduction

Education systems must be configured to equip individuals with appropriate skills aligned with contemporary demands. Specifically, given the fast-paced technological advancements, educational institutions must attach priority to 21st-century skills encompassing critical thinking, problem-solving, creativity, and collaboration (Bers et al., 2002; Zurnacı & Turan, 2022). The aforementioned skills have been regenerated in the course of time with the inclusion of current competencies, bringing to the fore the significance of coding as a universal language (European Commission, 2021). Coding is conceptualized as a core 21st-century skill, contributing to the configuration of human behaviour processes through computer science concepts. In other words, it involves algorithms that aspire to solve a problem or fulfil a duty by combining various technological tools (Çakıroğlu et al., 2011; Köse et al., 2025). As asserted by Fessakis et al. (2013), coding a relatively new concept plays a pivotal role in teaching children algorithmic skills, whereas Bers (2021) emphasized that coding education both prepares children for technological advancements and develops their systematic thinking skills. Additionally, Yu and Roque (2019) indicated that coding education arouses children's interest in computer technologies, offering opportunities to promote their cognitive, affective, physical, and social skills. Taken together, not only is coding education implemented in advanced class levels, but it also finds a wide range of applications in the pre-school period (Alıç Akdoğan, 2020; Canbeldek, 2020; Küçükkara & Aksüt, 2021; Şahin & Arıkan, 2024; Üstün & Gülay Ogelman, 2025; Zviel-Girshin et al., 2020). Therefore, gaining an understanding of prospective pre-school teachers' views on coding education is of prime importance, as their perspectives inform the refinement of the existing curriculum and teacher training programs.

The primary aim of this study is to investigate the prospective pre-school teachers' perceptions regarding the implementation of coding education in the teaching and learning environment.

1. Conceptual Framework

1.1 Coding Education in Early Childhood

The integration of coding education into pre-school settings has become an important field of inquiry in contemporary educational approaches (Kahraman et al., 2024). Exposure to coding activities in early years facilitates perceiving basic programming language in subsequent educational stages, as stated by Sullivan and Bers (2017).
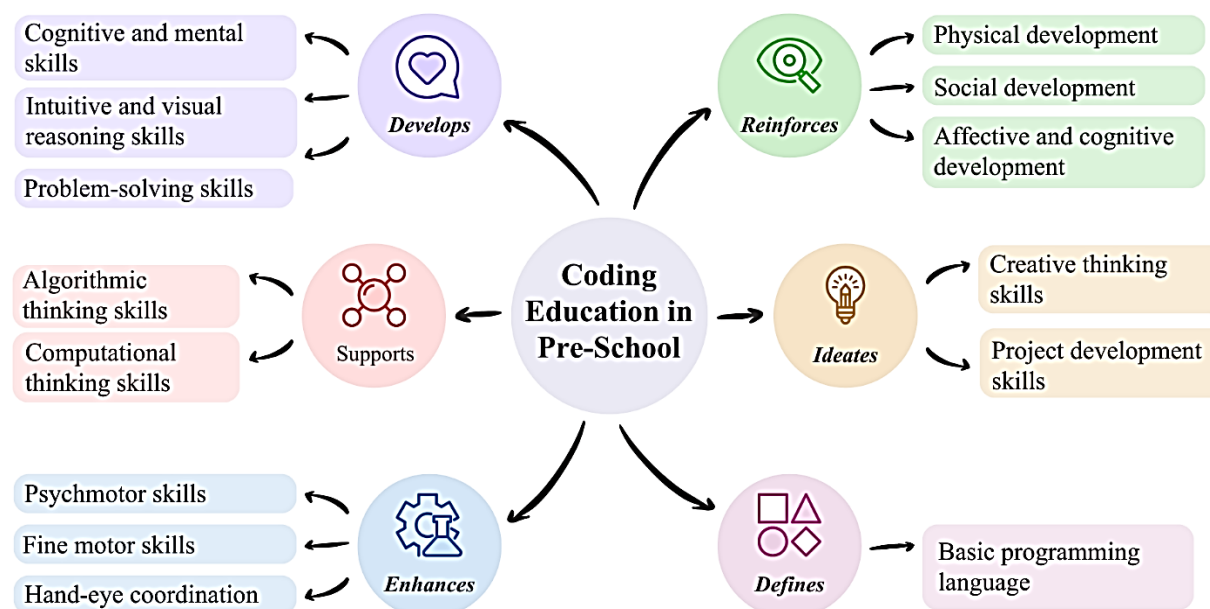

Figure-1: Benefits of Coding Education in Early Childhood

According to Erol and Kurt (2017), coding knowledge in pre-school instructional contexts contributes to children's cognitive and mental development, enhancing their problem-solving and project management skills (Resnick, 2013).

Flannery et al. (2013) indicated that the engagement of children in coding consolidates their fine motor skills and hand-eye coordination, whereas Kanmaz (2023) expressed that pre-school teachers present positive opinions regarding the impacts of coding education on children's cognitive, psychomotor, social, and linguistic development. From a curricular standpoint, Uğur Erdoğmuş (2021) suggested that the instruction schedules must formally include guidelines to fit coding into existing subjects, which necessitates the enhancement of teachers' coding proficiencies to effectively sustain coding education in early childhood.

2. METHODOLOGY

This section outlines the methodological framework of the study, including the research model, study group, data collection tools, and data analysis.

2.1 Research Model

The current study adopted a qualitative research method grounded in phenomenological design, which allows for investigating phenomena embedded in daily life that are not thoroughly understood in terms of their essential meaning (Yıldırım & Şimşek, 2016).

2.2 Study Group

The study was conducted with 20 prospective pre-school teachers enrolled at a state university in Türkiye. In line with the research objectives, criterion sampling as a purposeful sampling method was employed to select participants who exhibit the study's predetermined criteria (Patton, 2014). Accordingly, prospective pre-school teachers were required to meet the inclusion criteria below:

i. Having basic knowledge about coding education, and
ii. Having undergone training or worked in a pre-school educational institution that implemented coding-related activities for at least one academic term

2.3 Data Collection Tool

This study was initiated after obtaining ethics committee approval from the Social and Human Sciences Scientific Research and Publication Ethics Committee. Subsequent to designing a semi-structured interview form by the researchers, the questions were submitted for expert review to revise them based on the experts' recommendations. The final interview form consisted of 4 open-ended questions and was administered to 20 prospective pre-school teachers.

2.4 Data Analysis

The interview data obtained from the prospective pre-school teachers were analysed using descriptive analysis, which leads researchers to classify data into meaningful codes consistent with the study objective (Merriam, 2015).

3. FINDINGS

This section covers findings and interpretations regarding the perspectives of prospective pre-school teachers on coding education in early childhood.

3.1 Prospective Pre-School Teachers' Views on Coding Education in Early Childhood

Prospective pre-school teachers' views on coding education in early childhood are presented in Table 1.

Table-1: Perspectives of Prospective Pre-School Teachers on Coding Education in Early Childhood

Code	f
Problem-solving	19
Thinking skills (algorithmic, logical etc.)	17
Following instructions	12
Gamification	5
Total	53

As shown in Table 1, the perspectives of prospective pre-school teachers on coding education are organized into 4 codes: "problem-solving", "thinking skills (algorithmic, logical, etc.)", "following instructions", and "gamification". Below are their statements regarding the aforementioned issue:

PS-13 *"For me, coding is a process that organizes children's thinking patterns and supports skills such as sequencing, establishing relationships, and logical thinking. It doesn't necessarily mean sitting in front of a computer with technology; sometimes, simply following instructions can be the basis of coding."*

PS-9 *"Beyond the use of technology, we can say that coding is more of a learning process that structures thinking skills."*

PS-3 *"Coding should be included in early childhood education. If we want to support all aspects of a child's development, coding education should be provided according to the child's age, level, and development."*

3.2 Prospective Pre-School Teachers' Views on the Impacts of Coding Education in Early Childhood

Prospective pre-school teachers' views on the benefits of coding education in early childhood are shown in Table 2.

Table-2: Perspectives of Prospective Pre-School Teachers on the Impacts of Coding Education in Early Childhood

Code	f
Increasing cognitive competencies	22
Enhancing affective skills	18
Concretizing subjects	4
Total	44

As can be seen in Table 2 above, the prospective teachers' opinions regarding the impacts of coding education are addressed within 3 codes: "increasing cognitive competencies", "enhancing affective skills", and "concretizing subjects". To reinforce these findings, direct quotations from prospective pre-school teachers are presented below:

PS-5 *"I find coding education necessary and beneficial for this age group. When taught using the right methods, it supports children's **conceptual skills**. Furthermore, as long as it is game-based, children participate spontaneously."*

PS-6 *"During coding-focused education, I observed that children's **self-confidence** increased, their sense of achievement strengthened, and skills such as **patience**, **cooperation**, and **responsibility** in group work were reinforced."*

PS-20 *"Coding activities help children think differently in the **problem-solving process**, develop their ability to establish cause-and-effect relationships between events, and make progress in **planning**, **predicting**, and trial-and-error processes."*

3.3 Prospective Pre-School Teachers' Views on the Necessary Conditions for Coding Education

Prospective pre-school teachers' views on the necessary conditions for coding education are provided in Table 3.

Table-3: Perspectives of Prospective Pre-School Teachers on the Necessary Conditions for Coding Education

Code	f
Suitable teaching materials	16
Available learning environment	14
Time management	11
Administrative and parental support	7
Total	48

According to Table 3, the perspectives of prospective teachers on the necessary conditions for efficient implementation of coding education are categorized into 4 codes: "suitable teaching materials", "available learning environment", "time management", and "administrative and parental support". Prospective pre-school teachers' views on this issue are illustrated through the following direct quotations.

PS-4 *"The **materials** and **teaching environment** should be appropriate, and activities should be simplified according to age level. In addition, **time management** and children's attention span should be taken into account."*

PS-15 *"When conditions such as the provision of age-appropriate concrete materials and robotics kits, a safe and organized activity **environment**, and **support** for the process from **school administration** and **families** are met, education becomes more effective."*

3.4 Prospective Pre-School Teachers' Views on the Teacher Qualifications for Coding Education

Prospective pre-school teachers' views on the teacher qualifications for coding education are outlined in Table 4.

Table-4: Perspectives of Prospective Pre-School Teachers on the Teacher Qualifications for Coding Education

Code	f
Basic coding knowledge	23
Technological competence	20
Openness to new ideas and practices	17
Creativity and patience	15
Total	75

Table 4 indicates that prospective pre-school teachers' views regarding the teachers' required qualifications and competencies are grouped under 4 codes: "basic coding knowledge", "technological competence", "openness to new ideas and practices", and "creativity and patience". Below are the quotes from prospective pre-school teachers for the mentioned codes.

PS-17 *"Teachers who will provide coding education should first **receive coding education** themselves, understand the characteristics of the age group they will be teaching, and **be open to innovation**."*

PS-16 *"Teachers should possess an understanding of the **fundamental principles of coding** and its applications suitable for early childhood education, be able to provide children with game-based and research-based activities, be eager to develop their skills in **technology use**, serve as role models in problem-solving and **creative thinking**, adopt a **patient**, flexible teaching approach that encourages exploration, and be able to support teamwork, communication, and collaboration."*

Conclusion

The subsequent section presents a detailed discussion of the findings regarding prospective pre-school teachers' views on coding education in early childhood. Specifically, the results indicate that prospective teachers express positive opinions towards coding education in pre-school settings.

Prospective pre-school teachers point out that coding in early childhood is a process of developing algorithmic, logical, and reasoning skills. As stated by Fessakis et al. (2013), coding in early childhood education plays a vital role in cultivating children's logical thinking skills. Additionally, coding education is regarded as a crucial educational component for imparting 21st-century skills in children and contributing to the internalization of these skills (Karabak & Güneş, 2013; Shin et al., 2013; Williams, 2021).

The current study revealed that prospective pre-school teachers consider the benefits of early childhood coding education within the context of developing cognitive and affective skills and concretizing the lesson subjects. According to Erol and Kurt (2017), teaching coding and algorithms at an early age supports children's cognitive and mental development. On the contrary, Zimmerman and Christakis (2007) suggested that spending time in front of the screen may have negative effects on children's social, emotional, and linguistic skills. This finding clearly exposes the dual impact of coding education, which denotes that it embodies both positive and negative effects on children.

From the perspectives of the prospective pre-school teachers, teachers are required to possess fundamental concepts and practices related to coding as well as use technological tools and instructional materials effectively in order to deliver coding education. In addition, openness to innovation, creativity, and patience are listed among the other essential teacher characteristics for coding education.

According to prospective pre-school teachers, effective coding education requires the fulfillment of several conditions, such as appropriate teaching materials, a suitable learning environment, effective time management, and family and school administration support. Uğur Erdoğmuş (2021) underlined the significance of encouraging teachers by providing proper teaching materials.

Drawing on the study findings, the following recommendations regarding the implementation of coding education in early childhood are presented:

- Teachers should be offered systematic in-service training pertaining to the basic programming language to develop their technological competence.
- Teachers should be provided with appropriate teaching materials, resources, and learning environments so that they can effectively deliver coding education.
- Home-school collaboration should be reinforced by engaging school administrators and parents in the teaching and learning process.

Ethical Considerations

This study was conducted in accordance with internationally accepted ethical research standards. Prior to data collection, the participants were informed about the purpose, scope, and voluntary nature of the research. Informed consent was obtained from all prospective pre-school teachers participating in the semi-structured interviews. Participants were assured of anonymity and confidentiality, and no identifying personal information was included in the data analysis or reporting process. The collected data were used solely for academic research purposes, and participants retained the right to withdraw from the study at any stage without any negative consequences.

Author Contributions

- **Prof. Dr. Mehmet Nuri Gömleksiz:** Conceptualization of the study, research design, supervision of data collection, methodological guidance, interpretation of findings, and critical revision of the manuscript.

- **Res. Asst. Zehra Al:** Data collection, conducting semi-structured interviews, data coding and content analysis, literature review, drafting of the manuscript, and preparation of the final version.

All authors have read and approved the final manuscript and agree to be accountable for all aspects of the work.

Acknowledgements

Funding

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper. The research was conducted independently, and the results were not influenced by any financial or institutional affiliations.

Conference Submission Note

This paper has been **submitted for presentation and publication** within the scope of the **12th International CEO Social Sciences Congress (CEOSSC)**, to be held on **6–7 December 2025** at **Metropolitan University Karachi, Pakistan**, with online participation options. The study is prepared in accordance with the academic, ethical, and scientific standards of the CEO Congress and its collaborating international institutions.

References

1. Alıç Akdoğan, E. (2020). *Teachers' views on curriculum outcomes in the educational robotics and coding course* (Unpublished master's thesis). Bursa Uludağ University, Institute of Educational Sciences, Bursa, Türkiye.

2. Bers, M. U. (2021). From computational thinking to computational doing. In M. U. Bers (Ed.), *Teaching computational thinking and coding to young children* (pp. 1–20). IGI Global. https://doi.org/10.4018/978-1-7998-7310-5.ch001

3. Canbeldek, M. (2020). *An investigation of the effects of the "Producing Children" coding and robotics education program in early childhood education* (Unpublished doctoral dissertation). Pamukkale University, Institute of Educational Sciences, Denizli, Türkiye.

4. Çakıroğlu, Ü., Sarı, E., & Akkan, Y. (2011, September 22–24). The views of teachers on the contribution of teaching programming to gifted students' problem-solving skills. In *Proceedings of the 5th International Computer & Instructional Technologies Symposium*. Fırat University, Elazığ, Türkiye.

5. European Commission. (2021). *Coding is fun: Join @CodeWeekEU*. Shaping Europe's Digital Future. https://digital-strategy.ec.europa.eu/en/library/coding-fun-join-codeweekeu

6. Fessakis, G., Gouli, E., & Mavroudi, E. (2013). Problem solving by 5–6-year-old kindergarten children in a computer programming environment: A case study. *Computers & Education, 63*, 87–97. https://doi.org/10.1016/j.compedu.2012.11.016

7. Flannery, L. P., Silverman, B., Kazakoff, E. R., Bers, M. U., Bontá, P., & Resnick, M. (2013). Designing ScratchJr: Support for early childhood learning through computer programming. In J. P. Hourcade, E. A. Miller, & A. Egeland (Eds.), *Proceedings of the 12th International Conference on Interaction Design and Children* (pp. 1–10). Association for Computing Machinery. https://doi.org/10.1145/2485760.2485785

8. Kahraman, O., Yılmaz, Ş., Erdal, Ş., Ay, C., Yüksel, M., Özkan, O., Çilenti, G., & Yaman, S. (2024). Coding education and robotic programming in educational systems. *International Journal of Social and Humanities Sciences Research, 11*(104), 503–514. https://doi.org/10.5281/zenodo.10775059

9. Karabak, D., & Güneş, A. (2013). A curriculum proposal for software development for first-grade secondary school students. *Journal of Research in Education and Teaching, 2*(3), 175–181.

10. Köse, A., Demir, M., Kurban, A., Karakaş, C., & Harput, S. (2025). Coding instruction in preschool education: The case of preschool institutions in Ortahisar district, Trabzon. *Karadeniz Araştırmaları Enstitüsü Dergisi, 11*(23), 117–136.

11. Küçükkara, M. F., & Aksüt, P. (2021). An example of unplugged coding education in early childhood: Activity-based algorithms for problem-solving skills. *Araştırma Temelli Etkinlik Dergisi (ATED), 11*(2), 81–91.

12. Merriam, S. B. (2015). *Qualitative research: A guide to design and implementation* (S. Turan, Trans.). Nobel Publishing. (Original work published 2009)

13. Patton, M. Q. (2014). *Qualitative research and evaluation methods* (M. Bütün & S. B. Demir, Trans.). Pegem Academy. (Original work published 2002)

14. Resnick, M. (2013). Learn to code, code to learn. *EdSurge*. https://www.edsurge.com/news/2013-05-08-learn-to-code-code-to-learn

15. Shin, S., Park, P., & Bae, Y. (2013). The effects of an information-technology gifted program on friendship using Scratch programming language and Clutter. *International Journal of Computer and Communication Engineering, 2*(3), 246–249.

16. Sullivan, A., & Bers, M. U. (2017). Dancing robots: Integrating art, music, and robotics in Singapore's early childhood centers. *International Journal of Technology and Design Education, 28*(2), 325–346. https://doi.org/10.1007/s10798-017-9397-0

17. Şahin, H., & Arıkan, A. (2024). Robotic applications in preschool education. *Trakya Journal of Education, 14*(1), 260–286.

18. Uğur Erdoğmuş, F. (2021). How do early childhood education teachers perceive robotic education in kindergarten? A qualitative study. *Participatory Educational Research, 8*(2), 421–434.

19. Üstün, A. G., & Ogelman, H. G. (2025). A systematic review on preschool coding education and computational thinking. *The Journal of Limitless Education and Research, 10*(2), 389–475.

20. Williams, H. (2021). *No fear coding: Computational thinking across the K–5 curriculum* (2nd ed.). International Society for Technology in Education.

21. Yıldırım, A., & Şimşek, H. (2016). *Qualitative research methods in the social sciences* (10th ed.). Seçkin Publishing.

22. Yu, J., & Roque, R. (2019). A review of computational toys and kits for young children. *International Journal of Child-Computer Interaction, 21*, 17–36. https://doi.org/10.1016/j.ijcci.2019.04.001

23. Zimmerman, F. J., & Christakis, D. A. (2007). Associations between content types of early media exposure and subsequent attentional problems. *Pediatrics, 120*(5), 986–992. https://doi.org/10.1542/peds.2006-3322

24. Zurnacı, B., & Turan, Z. (2022). An analysis of studies on preschool coding education in Türkiye. *Kocaeli University Journal of Education, 5*(1), 258–286.

25. Zviel-Girshin, R., Luria, A., & Shaham, C. (2020). Robotics as a tool to enhance technological thinking in early childhood. *Journal of Science Education and Technology, 29*, 294–302. https://doi.org/10.1007/s10956-020-09804-9