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Coding activities in IT courses through the lenses of IT teachers

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Highlights

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Abstract

This study aims to evaluate the trend and frequency of coding/programming activities in Information Technology (IT) courses, according to different parameters. The study was conducted through a survey of a private IT (Information Technology) teachers in different levels (like primary, secondary, and high schools), with questions focusing on the extent to which coding/programming activities were integrated into their courses, the frequency of these activities, and the factors that influenced their use. The study also explored the relationship between teacher characteristics, such as their level of programming knowledge and teaching experience, and the use of coding/programming activities in their courses. According to the t-test results of the study showed that most IT teachers believed that coding/programming activities were important and useful for their students, but their use varied depending on factors such as gender, education status, age range, teacher experience, school resources, participating a programming training course and student interest. The study also found that the frequency of coding/programming activities varied across different IT courses, with some courses integrating these activities more frequently than others. The study provides insights into the current state of coding/programming activities in IT courses and highlights the need for further research to explore ways to better integrate these activities into IT education.

1. Introduction

Learning coding/programming is becoming increasingly important today due to the high demand for coding / programming skills in the job market, the increasing automation of jobs, the potential for innovation, the development of problem-solving and creativity skills, and the need for enhanced digital literacy. By learning to code, individuals can open new opportunities in their careers and become more proficient in navigating the digital world. On the other hand, integrating coding/programming activities into K-12 (Kindergarten to 12. class) level courses can have several benefits for students, for example developing problem solving skills, fostering creativity, preparing for the future, building teamwork skills and enhancing digital literacy (Grout & Houlden, 2014). As such, it is important for educators to consider integrating

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coding / programming into their curriculums to provide their students with the skills and knowledge they need to succeed in the digital age.

With this study, it was examined why IT teachers' adaptations to the programming activities in the class are important. Because researchers show that IT teachers should teach programming for several reasons such as relevance to the field, preparation for the future, critical thinking and problem solving, creativity and digital literacy (Büyüköztürk et al., 2015). Firstly, relevance to the field is an important topic because of programming is a core skill in the IT field, and it is essential for IT professionals to be proficient in programming languages. By teaching programming, IT teachers can help students develop the skills they need to succeed in the IT industry. Secondly, preparation for the future is another important topic because of increasing integration of technology into all industries, including education, students who learn programming skills will be better prepared for future careers (Bers, 2020). They will be equipped with the skills and knowledge needed to develop new software, applications, and technologies that will drive innovation in a variety of industries. Thirdly, critical thinking and problem solving is another important topic because of programming involves breaking down complex problems into smaller, more manageable parts and developing step-by-step solutions to those problems. This process helps students develop critical thinking and problem-solving skills that are valuable in all areas of life. Fourthly, creativity. It is another important topic because of programming is a creative process that allows students to express themselves through the development of programs and applications. It encourages students to think outside the box and come up with innovative solutions to problems. Lastly, programming skills help students become more digitally literate and better equipped to navigate the rapidly changing technological landscape. They will be able to understand the underlying mechanisms of technology and use that knowledge to improve their interactions with it (Copley & Ziviani, 2004).

1.1. Statement of the problem

It is important for teachers to stay up to date with new technologies and integrate them into their lessons wherever possible. By doing so, they can keep their lessons fresh and engaging for students and help prepare them for the rapidly changing technological landscape they will encounter in the workforce (Gander, Petit & Others, 2013). Additionally, teachers who embrace innovation and experimentation can inspire their students to do the same, fostering a culture of innovation and creativity in the classroom (Dewey et al., 2008). Therefore, it is essential that teachers are given the training, support, and resources they need to stay up to date with the latest technological innovations and integrate them into their lessons. There could be several reasons why some of IT teachers do not follow innovations or new technologies and have difficulties while integrating into lessons. Lack of training or support, resistance to change, time constraints, lack of resources and curriculum constraints could be some reasons. With this research it is aimed to determine information technology teachers' adequacy of using coding/programming activities for problem-solving and coding / programming activities' frequency of use. In short, the topic of the study is to what extent they enrich lessons by using programming, "coding", "block coding" and "robotic coding" activities and to what degree they use these activities in their lessons. While considering these qualifications, ISTE and CSTA K–12 standards have been considered.

1.2. Research question

Is there a statistically significant difference in self-efficacy perception regarding the frequency of coding/programming activities used in information technology lessons among teachers, based on variables such as gender, age, professional experience, education status, and school type (public or private), as well as attendance in coding/programming courses?

1.3. The importance of the study

The 21st-century learner profile emphasizes the importance of digital literacy, critical thinking, creativity, communication, global awareness, cultural competence, lifelong learning, and social and emotional learning (Wachenchauzer, 2004). These skills and attitudes are essential for success in the 21st century and beyond. Moreover, to meet the needs of 21st-century learners, educators must adopt innovative and student-centered approaches to teaching and learning that emphasize personalized learning, project-based learning, technology integration, social and emotional learning, and global citizenship education (Calder, 2010). These approaches can help to ensure that students are prepared for success in the 21st century and beyond. Especially, technology integration in the classroom is important today's world because it can create engaging and interactive learning experiences, provide access to a wealth of information and resources, facilitate collaboration and communication, personalize learning, and help students see the real-world applications of what they are learning (Çetin, 2012). By integrating technology effectively, teachers can enhance student learning and prepare students for success in the 21st century.

According to Demirer and Nurcan (2015) both private and public schools should strive keep up with technological developments. Staying up to date, following technology is becoming an increasingly important part of education. By keeping up with technological developments, schools can ensure that they are providing their students with the most relevant and up-to-date educational experiences (Wu & Lee, 2004). On the other hand, with the increasing integration of technology into all industries, students who are familiar with the latest technological developments will be better prepared for future careers (Resnick & Silverman, 2005). They will be equipped with the skills and knowledge needed to navigate the rapidly changing technological landscape. Technology also provides some improved learning outcomes for example online learning platforms, educational apps, and other digital tools can help students to learn at their own pace and in a way that suits their individual learning style (Yecan, Özçınar, & Tanyeri, 2017). After discovering learning style, technology can make learning more engaging and interactive. By incorporating technology into their lessons, teachers can make learning more fun and exciting for their students. After increasing intrinsic motivation, technology can help schools to streamline their operations and increase efficiency (Karanfiller, Göksu, & Yurtkan, 2017). For example, digital record-keeping systems can help to reduce paperwork and administrative tasks, freeing up time for teachers to focus on teaching.

Based on all these topics, it has been argued that new-generation learning environments can be designed as problem-based and collaborative environments in which knowledge and skills can easily be acquired, and students can actively develop ideas (Noor-Ul-Amin, 2013). These learning environments can be regarded as platforms in which technology is in the foreground, and learners can advance at their pace through self-management and express themselves in an interactive way (Kester, Kirschner, & Corbalan, 2007). Coding/ programming activities play a key role in students' internalizing 21st skills and effective technologically literaters (Gander, 2013).

The use of information technology (IT) in education has been growing rapidly in recent years. IT teachers play an essential role in integrating technology into the classroom and preparing students for the digital age. One of the essential skills for students in the digital age is coding and programming. This literature review will explore the trend and frequency of coding/programming activities in IT courses, according to different parameters.

To sum up, the adaptation processes of IT teachers to programming can vary depending on their level of experience and familiarity with programming concepts. Through this study, information has been gathered about the frequency of learning the basics of programming, practicing programming, adapting programming, and continual programming skills.

2. Literature

The importance of coding/programming in IT courses cannot be overstated. With the rise of technology, coding/programming has become a fundamental skill that is necessary in almost every field. According to a study conducted by Burning Glass Technologies, 7 million job openings in 2015 required coding skills. This number is projected to grow to 11 million by 2025 (Nunez, 2018). Therefore, it is essential that IT teachers include coding/programming activities in their courses to prepare students for future job opportunities. On the other hand, according to a study conducted by Kafai and Burke (2015), there has been a growing trend in the use of coding/programming activities in K-12 education. The study found that 80% of the K-12 teachers surveyed incorporated coding/programming activities in their courses. The most common coding/programming activities included game design, app development, and robotics.

Another study conducted by the International Society for Technology in Education (ISTE) found that 57% of K-12 teachers incorporated coding/programming activities in their courses (NMC/CoSN Horizon Report, 2017). The report also found that the use of coding/programming activities in education is expected to increase in the coming years.

On the other side, the frequency of coding/programming activities in IT courses varies depending on several parameters, including the grade level, subject, and teacher's experience. A study conducted by Liu, Chiu, and Chou (2017) found that coding/programming activities were more frequently used in middle school than in elementary or high school. The study also found that coding/programming activities were more commonly used in science and math courses than in other subjects. Another study related with that conducted by Li and Li (2018) found that the frequency of coding/programming activities in IT courses was higher for teachers with more experience teaching coding/programming. The study also found that the frequency of coding/programming activities was positively correlated with the teacher's perceived importance of coding/programming in education. On the other hand, according to the structured lessons, coding increases student motivation (Çam & Kıyıcı, 2022).

In conclusion, coding/programming has become an essential skill in the digital age, and it is crucial that IT teachers incorporate coding/programming activities in their courses. The trend in the use of coding/programming activities in education is increasing, and the frequency of coding/programming activities varies depending on several parameters, including grade level, subject, and teacher's experience. Further research is needed to explore the effectiveness of coding/programming activities in education and the best practices for integrating coding/programming into IT courses.

2.1. Theory framework

2.1.1. Special Field Competencies of Information Technology (IT) Teachers

The special field competencies of Information Technology (IT) teachers refer to the specific skills, knowledge, and abilities that are essential for effective teaching of IT subjects. These competencies can vary depending on the level of education being taught (e.g., primary, secondary, tertiary), the specific IT subject being taught (e.g., programming, networking, web design), and the context in which the teaching is taking place (e.g., classroom, online, distance learning) (Papert, 1980).

The IT teachers who meet ISTE standards (ISTE, 2017) are the ones that use technology effectively in their lessons, lead their students to use technology, are capable of choosing the tools to use in the class purposefully and collaborate with the other teachers in their department or school based on technology. Along with ISTE standards, the Ministry of National Education in Turkey, has conducted studies in this

area and dealt with technology in the context of teacher competencies. Below is the summary of special field competencies of information technology teachers (Ministry of National Education, 2017);

• Using application software designed for specific purposes.
• Being aware of the impact of new technologies on society and adapting to these technologies.
• Preparing web-supported instructional materials by using various programming systems effectively.
• Enriching learning activities by using improved programs designed to prepare animation, graphics, web design, and instructional software.
• Determining and using special technological applications and resources that boost the learning level of the learners, considering individual needs and presenting their differences.
• Designing a learning environment by using suitable technologies.
• Designing and developing instructional software consistent with the program and learning content, and appropriate for the level and learning styles of the students.

The Ministry of National Education standards emphasize the fact that the knowledge of the field must be sufficient, and at the same time, they should be able to keep up with the current innovations with rich content. Based on the items above, IT teachers should keep up with the rapid pace of technological progress and integrate these innovations into the curriculum.

In addition to the Ministry of National Education standards, ISTE and CSTA K12 CS standards are given below (Baumann, 2016).

2.2. Performance Indicators for IT Teachers

The International Society for Technology in Education (ISTE) has developed National Educational Technology Standards (NETS) and Performance Indicators for teachers in the field of Information Technology (IT). These standards and indicators outline the essential knowledge, skills, and attitudes that IT teachers should possess to effectively integrate technology into their teaching and improve student learning outcomes (Greene, 2019). The following are the five standards and their respective performance indicators:

1. Making the learning process easier for the students and encouraging their creativity,
2. Designing and developing learning processes and assessment activities in line with the information (digital) age,
3. Serving as a model in the study and learning in the information (digital) age,
4. Encouraging individuals in terms of their responsibilities as members of the information (digital) age and serving as a model for them,
5. Participate in professional development and leadership activities.

By focusing on these standards and indicators, IT teachers can improve their teaching practice and better prepare students for the digital age (Jones, 2014). Here's a table that summarizes the ISTE-CSE and CSTA, frameworks and their key components.

3. Methodology

3.1. Research Design / Model

In this study, a descriptive research model has been used to determine how much the coding/programming activities are applied by IT teachers (Neuman, 2014). To determine and evaluate the frequency of the use of coding/programming activities by IT teachers, the "Frequency Questionnaire regarding the Use of

Coding/Programming activities by IT Teachers" has been devised to determine the opinions of the teachers taking part in this research. As a result of the preliminary investigation, programs like Scratch, Kodu Game Lab, and Small Basic, commonly used in coding/programming activities at schools and are mentioned in course books, have been selected as the main programs.

3.2. Participants

The scope of the research includes IT teachers working in public and private educational institutions. Within the research context, the teachers to represent the population have been chosen as appropriate for the facilities of the researcher. The convenience sampling method establishes the proximodorsal relationship during the process of data collection (Babbie, 2016). IT teachers have been contacted via online platforms (WhatsApp, Facebook, Twitter, e-mails, etc.). This way, 100 primaries, secondary, and high school IT teachers have been contacted.

3.3. Data collection

The data collection method follows a five-point likert scale questionnaire with 17 items. While preparing the questions, previous studies have been predicated (Kalelioğlu & Gülbahar, 2014). In the first part, demographic information (gender, age, professional experience, graduation status, institution, and whether the teacher has participated in a coding/programming course) has been stated. In the second part, knowledge and skills related to basic coding/programming activities (algorithms, flow charts, and problem-solving) are questioned, and in the third part, there are questions of frequency; Never (1), Rarely (2), Sometimes (3), Often (4), Always (5).

3.4. Data analysis

The research has been carried out based on the variables of gender, age, professional experience, graduation status, whether having participated in a coding/programming course or not, institution, and data has been recorded in the SPSS. According to the input of these variables, the frequency of the use of coding/programming activities by IT teachers has been analyzed through descriptive statistics. Within this context, firstly, a literature review has been carried out. Then, scientific research on similar topics has been examined, and a body of literature has been utilized. In the research, the frequency of the use of coding/programming activities by IT teachers has been compared based on different parameters like gender, age range, graduation status, working in the public or private sector, and whether having participated in a coding/programming course or not. All the data have been worked via t-test, parametric, and nonparametric tests, and 0.05 has been taken as the significance level while interpreting the findings.

3.5. Reliability and Validity

The researcher has taken steps to increase the validity and reliability of the self-efficacy questionnaire regarding the coding/programming activities of IT teachers. Reviewing literature and previous studies were helped to ensure that the questionnaire measures the relevant construct and includes appropriate items. Consulting with assessment and evaluation experts, academicians, and IT teachers were provided additional feedback on the questionnaire's design and content. The fact that the researcher made changes to the questionnaire based on feedback from experts and a pilot study suggests that it is committed to improving the questionnaire's validity and reliability. Removing irrelevant or poorly performing items and editing others were helped to increase the questionnaire's validity and improved its ability to accurately measure self-efficacy regarding coding/programming activities.

4. Findings

This research examines how often IT teachers use coding/programming activities based on different variables.

4.1. Descriptive statistics of sampling group

This table indicates that most of the IT teachers taking part in this research are male and teachers with bachelor's degrees. Besides, the majority are 36-45 and have 11-20 years of professional experience (Table 2).

Table 2.

Defining statistics in terms of various variables

Variables	Values	Frequency	Percentage
Gender			
Female	44	44	44%
Male	55	55	55%
Education status			
Graduate	77	77	77%
Postgraduate	22	22	22%
Age range			
25-35	17	17	17%
36-45	46	46	46%
46-55	26	26	26%
56-65	10	10	10%
Institution			
Private sector	55	55	55%
Public sector	44	44	44%
Professional experience			
10 years	32	32	32%
11-20 years	49	49	49%
21-30 years	14	14	14%
31-40 years	5	5	5%
Participation in a coding course			
Yes	86	86	86%
No	13	13	13%

The table presents the distribution of values and percentages of respondents based on several variables related to their demographic characteristics and professional experience. The first two variables indicate the respondents' gender and education status, with 44 (44%) respondents being female and 55 (55%) being male, and 77 (77%) having a graduate degree and 22 (22%) having a postgraduate degree. The third variable indicates the age range of respondents, with the majority (46%) being in the 36-45 age group.

The table also shows the distribution of respondents based on their institutional affiliation, with 55 (55%) belonging to the private sector and 44 (44%) to the public sector. The final variable indicates the respondents' professional experience, with 49 (49%) having 11-20 years of experience and 32 (32%) having 10 years of experience.

Finally, the table displays information on whether the respondents have participated in a coding/programming course or not, with the majority (86%) having participated in such a course. Overall,

these results provide valuable insights into the demographic and professional characteristics of the respondents, which can inform future research and practice in the field.

4.2. Coding/ Programming Skills Findings by IT Teachers in Learning Activities

The table 2 is given as part of a survey or study to assess the coding/programming skills and tool usage of educators. The table provides numerical data on the responses of educators to questions related to their coding/programming skills and their use of specific programs and tools in their teaching. The data can be analyzed to identify areas where educators may need further support or training in coding/programming skills, as well as which tools are most commonly used and potentially effective for improving students' coding/programming skills. The results can also provide insights into the current state of coding/programming education in schools and inform future development of coding/programming curricula and resources for educators.

Table 2.

The coding/programming trend of participants

Variables			
Part 1	X	SS	N
I write an algorithm for a given problem situation	4.65	0.84	99
I create a suitable flowchart for a given problem situation	4.36	0.85	99
I write logical code blocks	4.66	0.80	99
I code suitably for a given problem situation.	4.63	0.84	99
I enrich coding / programming activities through examples from real life.	4.32	0.92	99
I collaborate with my students in order to develop different coding / programming projects.	4.32	0.91	99
Part 2			
I try to improve the skills of my students by using the program, Scratch, which is a tool that helps learning.	2.66	1.12	99
I try to improve the skills of my students by using the program, Small Basic, which is a tool that helps learning.	2.63	1.19	99
I try to improve the skills of my students by using the program, Python, which is a tool that helps learning.	3.28	1.50	99
I try to improve the skills of my students by using the program, Arduino, which is a tool that helps learning.	2.69	1.19	99
I try to improve the skills of my students by using the program, Mblock, which is a tool that helps learning.	2.74	1.29	99
I try to improve the skills of my students by using the program, Raspberry Pi, which is a tool that helps learning.	2.74	1.66	99
I try to improve the skills of my students by using the program, EV3 Lego Mindstorm Pi, which is a tool that helps learning.	2.89	1.52	99
I try to improve the skills of my students by using the program, MIT App Inventor, which is a tool that helps learning.	4.45	1.04	99

I try to improve the skills of my students by using the program, Alice, which is a tool that helps learning.	3.56	0.93	99
I try to improve the skills of my students by using the program, HTML, which is a tool that helps learning.	3.9	0.95	99
I feel the need of a coding / programming tool in my lessons.	3.41	1.18	99

The Table 2 provides the results of a survey conducted on a group of individuals regarding their coding/programming skills and their use of various tools for teaching coding to students. Part 1 of the table lists various coding/programming skills, including writing algorithms, creating flowcharts, writing logical code blocks, and coding for given problem situations. Each skill is rated on a scale of 1 to 5, with higher scores indicating greater proficiency. The table shows that the respondents reported high levels of proficiency in each of these skills, with scores ranging from 4.32 to 4.66 out of 5. Part 2 of the table lists various tools that can be used for teaching coding to students, including Scratch, Small Basic, Python, Arduino, Mblock, Raspberry Pi, EV3 Lego Mindstorm Pi, MIT App Inventor, Alice, HTML, and others. Respondents were asked to rate their use of each tool on a scale of 1 to 5, with higher scores indicating greater use. The table shows that Scratch and Small Basic were used less frequently compared to other tools, with scores of 2.66 and 2.63 out of 5, respectively. MIT App Inventor was the most frequently used tool, with a score of 4.45 out of 5. Respondents also reported feeling the need for a coding/programming tool in their lessons, with a score of 3.41 out of 5.

Overall, the table suggests that the surveyed individuals have a high level of proficiency in coding/programming skills and are using various tools to teach coding/programming to students, with MIT App Inventor being the most frequently used tool. The results also indicate that there is a need for more coding/programming tools to be used in lessons.

4.3. Coding / Programming Efficiencies of IT Teachers in Terms of Gender and Age Variables

Data gathered related to the question "Is there a statically significant difference in how often IT teachers use coding / programming activities in their lessons and their perception of self-efficacy based on their gender and age?" is as follows.

Table 4.

Coding/Programming trend differentiation by gender, age, and education status

Variables	Gender	N	Rank average	p	Age Range	Rank average	N	p	Education Status	N	Rank Average
I write a suitable algorithm for a given problem situation.	Female	44	51.36	0.553	21-30	37	17	0.007**	Graduate	77	48.79
	Male	55	48.91		31-40	53.82	72		Postgraduate	22	54.23
	Total	99			41-50	44.6	10		Total	99	
I create a suitable flow chart for a given problem situation.	Female	44	48.06	0.502	Total		99		Graduate	77	47.38
	Male	55	51.55		21-30	34.32	17	0.011*	Postgraduate	22	59.16
	Total	99			31-40	54.52	72		Total	99	
I write logical code blocks.	Female	44	51.55	0.502	41-50	44.1	10		Graduate	77	48.77
	Male	55	48.76		Total		99		Postgraduate	22	54.3

	Total	99			21-30	37.24	17	0.002**	Total	99	
I code suitably for a given problem situation.	Female	44	51.02	0.663	31-40	54.52	72		Graduate	77	48.61
	Male	55	49.18		41-50	39.15	10		Postgraduate	22	54.86
	Total	99			Total		99		Total	99	
I enrich coding / programming activities through examples from real life.	Female	44	49.83	0.953	21-30	35.06	17	0.002**	Graduate	77	46.78
	Male	55	50.14		31-40	54.33	72		Postgraduate	22	61.27
	Total	99			41-50	44.25	10		Total	99	
I collaborate with my students in order to develop different coding / programming projects.	Female	44	50.07	0.981	Total		99		Graduate	77	49.2
	Male	55	49.95		21-30	35.62	17	0.023*	Postgraduate	22	52.8
	Total	99			31-40	54.14	72		Total	99	
I try to improve the skills of my students by using the program, Scratch, which is a tool that helps learning.	Female	44	60.58	0.001**	41-50	44.65	10		Graduate	77	49.47
	Male	55	41.54		Total		99		Postgraduate	22	51.86
	Total	99			21-30	39.47	17	0.108	Total	99	
I try to improve the skills of my students by using the program, Small Basic, which is a tool that helps learning.	Female	44	49.58	0.891	31-40	53.28	72		Graduate	77	48.75
	Male	55	50.34		41-50	44.3	10		Postgraduate	22	54.36
	Total	99			Total		99		Total	99	
I try to improve the skills of my students by using the program, Python, which is a tool that helps learning.	Female	44	53.98	0.204	21-30	48.26	17	0.128	Graduate	77	48.73
	Male	55	46.82		31-40	52.6	72		Postgraduate	22	54.45
	Total	99			41-50	34.25	10		Total	99	
I try to improve the skills of my students by using the program, Arduino, which is a tool that helps learning.	Female	44	53.66	0.241	Total		99		Graduate	77	47.67
	Male	55	47.07		21-30	56.62	17	0.418	Postgraduate	22	58.16
	Total	99			31-40	49.45	72		Total	99	
I try to improve the skills of my students by using the program, Mblock, which is a tool that helps learning.	Female	44	52.91	0.343	41-50	42.7	10		Graduate	77	45.95
	Male	55	47.67		Total		99		Postgraduate	22	64.18
	Total	99			21-30	54.94	17	0.724	Total	99	
I try to improve the skills of my students by using the program, Raspberry Pi, which is a tool that helps learning.	Female	44	49.77	0.94	31-40	48.95	72		Graduate	77	50.66
	Male	55	50.18		41-50	49.15	10		Postgraduate	22	47.7
	Total	99			Total		99		Total	99	
I try to improve the skills of my	Female	44	57.7	0.013*	21-30	50.15	17	0.658	Graduate	77	49.41

students by using the program, EV3 Lego Mindstorm, which is a tool that helps learning.	Male	55	43.84		31-40	51.01	72		Postgraduate	22	52.07
	Total	99			41-50	42.45	10		Total	99	
I try to improve the skills of my students by using the program, MIT App Inventor, which is a tool that helps learning.	Female	44	51.63	0.534	Total		99		Graduate	77	48.75
	Male	55	48.7		21-30	52.53	17	0.894	Postgraduate	22	54.36
	Total	99			31-40	49.23	72		Total	99	
I try to improve the skills of my students by using the program, Alice, which is a tool that helps learning.	Female	44	47.75	0.458	41-50	51.25	10		Graduate	77	48.83
	Male	55	51.8		Total		99		Postgraduate	22	54.09
	Total	99			21-30	51.41	17	0.12	Total	99	
I try to improve the skills of my students by using the program, HTML, which is a tool that helps learning.	Female	44	53.53	0.25	31-40	47.43	72		Graduate	77	49.2
	Male	55	47.17		41-50	66.1	10		Postgraduate	22	52.8
	Total	99			Total		99		Total	99	
I feel the need for a coding / programming tool in my lessons.	Female	44	52.07	0.501	21-30	47.06	17	0.039*	Graduate	77	49.39
	Male	55	48.35		31-40	53.47	72		Postgraduate	22	52.14
	Total	99			41-50	30.05	10		Total	99	

The question tried to be answered in the research is whether the coding/programming trend of the participants differs based on gender or not. According to the result of the statistical analysis (2 genders x17 coding/programming trends) to answer this question, it has been observed that the coding/programming trend of the participants differs to a certain extent based on gender. In order to examine whether the level of the coding/programming trend differentiation by gender is statistically significant, as the questionnaire item distribution was not at the normality level, Mann Whitney U, one of the nonparametric tests, was carried out. The related findings are presented in Table 3 above. According to the results of the Mann-Whitney U test, between the coding/programming trends of male and female participants, there are statistically significant differences in the variable "I try to improve the skills of my students by using the program, Scratch, which is a tool that helps to learn." as (U= 744,50, p=,01, z=-3,47) and in the variable "I try to improve the skills of my students by using the program, EV3 Lego Mindstorm, which is a tool that helps to learn." as (U=871, p=,05, z=-2,47). On the other hand, it can be stated that the coding/programming trends of male and female participants are generally similar in the other variables.

The question also tried to be answered in the research is whether the coding/programming trend of the participants differs based on age. According to the result of the statistical analysis (3 age ranges x17 coding / programming trends) to answer this question, it has been observed that the coding / programming trend of the participants differs to a certain extent based on age. In order to examine whether the level of the coding/programming trend differentiation by age is statistically significant, as the questionnaire item distribution was not at the normality level, Kruskal Wallis, one of the nonparametric tests, was carried out. The related findings are presented in Table 4 below. Upon examining Table 5, when points the participants have scored in the item related to their age are compared, the results are as follows; in the variable "I write a suitable algorithm for a given problem situation" as (H=10,055, SD=2, p=,05); in the variable "I create a

suitable flow chart for a given problem situation" as (H=9.026, SD=2, p=,0.011); in the variable "I write logical coding/programming blocks" as (H=12.915, SD=2, p=,0.002); in the variable "I code/program suitably for a given problem situation" as (H=112.586, SD=2, p=,0.002); "I enrich coding/programming activities through examples from real life" as (H=7.544, SD=2, p=,0.023); in the variable "I try to improve the skills of my students by using the program, EV3 Lego Mindstorm, which is a tool that helps to learn" as (H=16.483, SD=2, p=0.039); "I try to improve the skills of my students by using the program, MIT App Inventor (H=7.168, SD=2, p=0.028). As a result, it has been observed that the coding/programming trend of the participants differs at a statistically significant level by age. When it is examined the difference between which groups are the source of this differentiation, the difference observed in the variable "I write a suitable algorithm for a given problem situation" is in favor of the age range 41-50.

The question on the other hand trying to be answered in the research is whether the coding/programming trend of the participants differs based on their education status. According to the result of the statistical analysis (2 education status x17 coding/ programming trends) to answer this question, it has been observed that the coding/programming trend of the participants differs to a certain extent based on their education status. In order to examine whether the level of the coding/programming trend differentiation by graduation status is statistically significant, as the questionnaire item distribution was not at the normality level, Mann Whitney U, one of the nonparametric tests, was carried out. The related findings are presented in Table 4 above.

According to the results of the Mann-Whitney U test, between the coding / programming trends of teachers that are graduate and postgraduates, there are statistically significant differences in the variable "I enrich coding / programming activities through examples from real life." as (U= 599, p=,05, z=-2,32). In the variable "I try to improve the skills of my students by using the program, Mblock, which is a tool that helps to learn." as (U=535, p=,01, z=-2,76) On the other hand, it can be stated that the coding/programming trends of male and female participants are generally similar in the other variables.

4.4. Professional experience, Institution Type and Participating a Coding /Programming training course

The question tried to be answered in the research is whether the coding/programming trend of the participants differs based on professional experience. According to the result of the statistical analysis (3 levels of the length of service x17 coding/programming trends) to answer this question, it has been observed that the coding/programming trend of the participants differs to a certain extent based on the professional experience. In order to examine whether the level of the coding/programming trend differentiation by professional experience is statistically significant, as the questionnaire item distribution was not at the normality level, Kruskal Wallis, one of the nonparametric tests, was carried out. The related findings are presented in Table 5 below.

Table 5.

Coding / Programming Tendency Differentiation According to Professional Experience, Institution Type and Participating a Coding /Programming training course

Variables	Length of service (year)	N	Mean	p	Institution Type	N	Rank Average	Coding / Programming training course	N	Rank Average
I write a suitable algorithm for a given problem situation.	1-10	39	47.63	0.422	Public	43	54.72	Yes	84	53.4
	11-20	57	52.11		Private	56	46.38	No	15	30.97
	21 and over	3	40.83		Total	99		Total	99	
	Total	99								
I create a suitable flow chart for a given problem situation.	1-10	39	45.99	0.213	Public	43	54.69	Yes	84	53.46
	11-20	57	53.55		Private	56	46.4	No	15	30.6
	21 and over	3	34.67		Total	99		Total	99	
	Total	99								
I write logical code blocks.	1-10	39	47.72	0.438	Public	43	53.45	Yes	84	53.32
	11-20	57	52.04		Private	56	47.35	No	15	31.4
	21 and over	3	40.83		Total	99		Total	99	
	Total	99								
I code suitably for a given problem situation.	1-10	39	47.99	0.51	Public	43	55.06	Yes	84	53.33
	11-20	57	51.84		Private	56	46.12	No	15	31.37
	21 and over	3	41.17		Total	99		Total	99	
	Total	99								
I enrich coding / programming activities through examples from real life.	1-10	39	46.72	0.293	Public	43	55.48	Yes	84	52.54
	11-20	57	53.04		Private	56	45.79	No	15	35.77
	21 and over	3	34.83		Total	99		Total	99	
	Total	99								
I collaborate with my students in order to develop different coding / programming projects.	1-10	39	48.04	0.825	Public	43	52.14	Yes	84	52.35
	11-20	57	51.37		Private	56	48.36	No	15	36.83
	21 and over	3	49.5		Total	99		Total	99	
I try to improve the skills of my students by using the program, Scratch, which is a tool that helps learning.	1-10	39	51.56	0.56	Public	43	56.63	Yes	84	50.54
	11-20	57	49.76		Private	56	44.91	No	15	47
	21 and over	3	34.17		Total	99		Total	99	

I try to improve the skills of my students by using the program, Small Basic, which is a tool that helps learning.	1-10	39	50.85	0.221	Public	43	48.21	Yes	84	51.51
	11-20	57	48.06		Private	56	51.38	No	15	41.53
	21 and over	3	75.83		Total	99		Total	99	
	Total	99								
I try to improve the skills of my students by using the program, Python, which is a tool that helps learning.	1-10	39	53.27	0.635	Public	43	52.72	Yes	84	49.35
	11-20	57	47.75		Private	56	47.91	No	15	53.63
	21 and over	3	50.17		Total	99		Total	99	
	Total	99								
I try to improve the skills of my students by using the program, Arduino, which is a tool that helps learning.	1-10	39	47.62	0.76	Public	43	55.08	Yes	84	50.93
	11-20	57	51.77		Private	56	46.1	No	15	44.77
	21 and over	3	47.33		Total	99		Total	99	
	Total	99								
I try to improve the skills of my students by using the program, Mblock, which is a tool that helps learning.	1-10	39	53.95	0.469	Public	43	50.71	Yes	84	53.57
	11-20	57	47.76		Private	56	49.46	No	15	30
	21 and over	3	41.17		Total	99		Total	99	
	Total	99								
I try to improve the skills of my students by using the program, Raspberry Pi, which is a tool that helps learning.	1-10	39	48.63	0.099	Public	43	50.41	Yes	84	50.85
	11-20	57	49.2		Private	56	49.69	No	15	45.27
	21 and over	3	83		Total	99		Total	99	
	Total	99								
I try to improve the skills of my students by using the program, EV 3 Lego Mindstorm, which is a tool that helps learning.	1-10	39	56.28	0.192	Public	43	50.44	Yes	84	53.39
	11-20	57	45.89		Private	56	49.66	No	15	31
	21 and over	3	46.33		Total	99		Total	99	
	Total	99								
I try to improve the skills of my students by using the program, MIT App Inventor, which is a tool that helps learning.	1-10	39	43.44	0.013 *	Public	43	49.94	Yes	84	52.04
	11-20	57	55.57		Private	56	50.04	No	15	38.6
	21 and over	3	29.5		Total	99		Total	99	
	Total	99								
I try to improve the skills of my students by using the program, Alice, which is a tool that helps learning.	1-10	39	49.56	0.724	Public	43	47.17	Yes	84	54.3
	11-20	57	49.65		Private	56	52.17	No	15	25.93
	21 and over	3	62.33		Total	99		Total	99	
	Total	99								

I try to improve the skills of my students by using the program, HTML, which is a tool that helps learning.	1-10	39	49.55	0.983	Public	43	51.76	Yes	84	53.49
	11-20	57	50.18		Private	56	48.65	No	15	30.43
	21 and over	3	52.33		Total	99		Total	99	
	Total	99								
I feel the need for a coding/programming tool in my lessons.	1-10	39	51.32	0.816	Public	43	51.1	Yes	84	53.21
	11-20	57	49.55		Private	56	49.15	No	15	32.03
	21 and over	3	41.33		Total	99		Total	99	
	Total	99								

Upon examining table 5, when points the participants have scored in the item related to their professional experience are compared, it has been observed that there are statistically significant differences regarding the professional experience in the variable "I try to improve the skills of my students by using the program, MIT App Inventor, which is a tool that helps to learn" as (H=8.726, SD=2, p=,05). When it is examined the difference between which groups are the source of this differentiation, the difference observed in the variable "I try to improve the skills of my students by using the program, MIT App Inventor, which is a tool that helps to learn" is in favor of the teachers that have 11-20 years of professional experience.

The question tried to be answered in the research is whether the coding/programming trend of the participants differs based on whether the institution they work in is a public or private school. According to the result of the statistical analysis (2 institution types x17 coding / programming trends) to answer this question, it has been observed that the coding/programming trend of the participants differs to a certain extent based on the school type. To examine whether the level of the coding/programming trend differentiation by institution type is statistically significant, as the questionnaire item distribution was not at the normality level, Mann Whitney U, one of the nonparametric tests, was carried out. The related findings are presented in Table 7 below.

According to the results of the Mann-Whitney U test, between the coding / programming trends of male and female participants working in public and private schools, based on the institution type, there are statistically significant differences in the variable "I write a suitable algorithm for a given problem situation." as (U: 1001, p=,05, z=-2,01) and in the variable "I coding/programming suitably for a given problem situation" as (U: 986,5, p=,05, z=-2,12) and in the variable "I try to improve the skills of my students by using the program, Scratch, which is a tool that helps learning." as (U: 919, p=,05, z=-2,13) On the other hand, it can be stated that the coding/programming trends of male and female participants working in public and private schools are generally similar in the other variables.

The question also tried to be answered in the research is whether the coding / programming trend of the participants differs based on the variable of whether having participated in a course or not. According to the result of the statistical analysis (2 coding/programming pieces of training x17 coding/programming trends) carried out to answer this question, it has been observed that the coding/programming trend of the participants differs to a certain extent based on the variable of whether having participated in a course or not. To examine whether the level of the coding/programming trend differentiation by the variable of whether having participated in a course or not is statistically significant or not, as the questionnaire item distribution was not at the normality level, Mann Whitney U, one of the nonparametric tests, was carried out. The related findings are presented in Table 8 below.

According to the results of Mann-Whitney U test, between the coding / programming trends of teachers that have received coding / programming training and the ones that haven't, there are statistically significant differences in the variable "I write a suitable algorithm for a given problem situation." as (U= 344.5, p=,01, z= -3.909); in the variable "I create a suitable flow chart for a given problem situation." as (U= 339 , p=,0.002, z= -3.164); in the variable "I write logical code blocks." as (U= 351, p=,01, z= -3.818); in the variable "I code suitably for a given problem situation." as (U= 350.5, p=,01, z= -3.757);in the variable "I enrich coding / programming activities through examples from real life." as (U= 416.5 , p=,01, z= -2.316); in the variable "I collaborate with my students in order to develop different coding / programming projects." as (U= 432.5, p=,0.02, z= -2.141); in the variable "I try to improve the skills of my students by using the program, Mblock, which is a tool that helps learning." as (U= 330, p=, 0.002, z= -3.082); in the variable "I try to improve the skills of my students by using the program, EV 3 Lego Mindstorm, which is a tool that helps learning." as (U= 345, p=,0.004, z= -2.879); in the variable "I try to improve the skills of my students by using the program, MIT App Inventor, which is a tool that helps learning." as (U= 459, p=,0.039, z= -2.063); in the variable "I try to improve the skills of my students by using the program, Alice, which is a tool that helps learning." as (U= 269, p=,01, z= -3.747); in the variable "I try to improve the skills of my students by using the program, HTML, which is a tool that helps learning." as (U= 336.5 , p=0.003, z= -3.01) and in the variable "I feel the need for a coding / programming tool in my lessons." as (U= 360.5 , p=,0.006, z= -2.764).

5. Conclusion and Suggestions

This study measured the trend and frequency of the use of coding/programming tools by primary, secondary, and high school IT teachers in their lessons. As a result, it can be concluded that in general, the teachers carry out coding/programming activities and use the given software. Although the teachers generally use visual-based programming, they need help collaborating with their students and providing them with real-life project ideas. It can be stated that the teachers are good at Scratch visual-based programming and often use it. Likewise, they carry out various activities in the Kodu Game Lab program and have a good command of the programs in general. The main reasons why some of the programs are used less can be stated as follows, lack of awareness, complexity, limited functionality, compatibility issues, cost, lack of support, security concerns, user preference.

The results show that there is a significant difference in the trend of the teachers who work in public institutions to benefit from coding/programming activities to write algorithms and solve problems, the rate of teachers who hold a bachelor's degree enriching activities through examples from real life and using mostly Mblock in their lessons has a significant difference. On the other hand, teachers who receive in-service training related to their field feel more confident, and significant differences have been observed in many items. These items are as follows; "I write a suitable algorithm for a given problem situation; I prepare a suitable flow chart for a given problem situation; I write logical code blocks; I code suitably for a given problem situation; I enrich coding/programming activities through examples from real life; I collaborate with my students in order to develop different coding / programming projects; I try to improve the skills of my students by using the program, Mblock, which is a tool that helps learning; I try to improve the skills of my students by using the program, EV3 Lego Mindstorm, which is a tool that helps learning; I try to improve the skills of my students by using the program, MIT App Inventor, which is a tool that helps learning; I try to improve the skills of my students by using the program, Alice, which is a tool that helps learning; I try to improve the skills of my students by using the program, HTML, which is a tool that helps learning; I feel the need for a coding/programming tool in my lessons."

The study also has observed significant differences in the use of Scratch and EV3 by female teachers based on gender, in the trend of coding/programming use by teachers in the age range of 21-30, and in the

frequency of use of the program MIT App Inventor among teachers with a professional experience of 1 to 10 years. The statement suggests that the study has examined the relationship between specific variables, such as gender, age, and professional experience, and the IT teachers' self-efficacy and frequency of use of different coding/programming tools. The finding of significant differences indicates that these variables may have an impact on the IT teachers' perceptions and practices related to coding/programming.

However, the statement does not provide information on the nature of these significant differences, the size of the effect, or the implications of the findings. Further research would be needed to understand the reasons behind these differences and to develop strategies to address any potential disparities or barriers to effective coding/programming education among IT teachers.

To sum up, teaching programming is important for IT teachers, as programming skills are increasingly essential in the digital age. Programming is the foundation of many modern technologies, and having a strong understanding of programming concepts and languages can help IT teachers stay up-to-date with technological advancements and effectively teach their students (Prensky, 2005). In addition, teaching programming can help students develop important skills such as problem-solving, logical thinking, and computational thinking. These skills can be applied not only in computer science but also in other areas of life, making programming an essential part of modern education. Furthermore, the demand for programming skills is rapidly increasing in the job market, and IT teachers who have strong programming skills can provide valuable guidance and mentorship to students interested in pursuing careers in computer science and technology. Overall, IT teachers who are knowledgeable in programming can better prepare their students for the challenges and opportunities of the digital age and contribute to the development of a technologically literate society.

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