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Evaluating Coding-Based Entertainment Applications in the Context of 21st Century Skills According to Teachers' Opinions

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***Abstract*:** The purpose of this study is to assess teachers' opinions about coding-based entertainment applications in the context of 21st-century skills. Teachers' opinions were analyzed using the Many facet Rasch measurement model. The study group of the research consists of 14 teachers working in different regions of Turkey. According to the Rasch measurement model, the study has three facets. The first of these facets is the teachers as 14 raters (judges). The other facet is six entertainment applications based on coding. The third facet consists of 11 items (criteria) established for these applications. In this study, coding-based applications such as Scratch, Code.org, CodeMonkey, CodeCombat, Mobil Kod (EBA), and mBlock were examined based on teachers' opinions. The analysis showed that the Scratch and mBlock applications had the highest quality while the Mobil Kod application had the lowest quality. In addition, it was found that through the use of coding-based applications, it may be difficult to develop students' understanding of solidarity and benevolence. On the other hand, teachers indicated that these applications arouse students' curiosity and interest in new developments and enable them to learn by doing. As a result of the analysis, it was also found that judges differ in terms of their severity and leniency. It is expected that the results of the study will contribute to this area.
Keywords: 21st-century skills, Coding-based entertainment applications, Many facet Rasch measurement model, Teachers' opinions.

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Introduction

In the 21st-century, which we call the digital age or information age, science and technology are developing rapidly and causing great changes in societies (Esgil & Gündüz, 2019; Gültepe, 2018). Technological development is proceeding in many fields, including healthcare, entertainment, security and defense, finance and banking, engineering, and architecture. One of these fields in which information technologies have developed and impacted is education (Keçeci, Alan & Zengin, 2016). In recent years, information technologies have changed the structure of the education system and brought the need for innovation. Technological tools that provide many innovations and conveniences in learning and teaching have brought a different perspective to the understanding of education. Thus, the importance of technology in education and training practice is constantly increasing. This importance proves the importance of taking computer science courses at a young age (Esgil & Gündüz, 2019). Especially recently, many countries are trying to include subjects such as computer science and computational thinking in elementary school curricula to increase employment in the information and communication sector (Bocconi et al., 2016; Esgil & Gündüz, 2019; Sayın, 2020). It can be said that computer education will greatly contribute to children's future career choices and the durability of their computer skills (Ceylan & Gündoğdu, 2018). It is predicted that computer education will have a greater place in curricula everywhere in the world in the future (Aytekin, Sönmez Çakır, Yücel & Kulaözü, 2018).

The development of technology in all fields leads to the importance of producing this technology. In this context, coding education, which is one of the most important tools to shape the future, comes to the fore. With the development and change of technology in recent years, coding education, which used to be taught at the university or secondary school level, has started to be taught at the elementary and kindergarten level (Bağra & Kılınç, 2021; Baz, 2018; Çavdar, Kılıçer & Emmioglu Sarıkaya, 2022; Esgil & Gündüz, 2019). To produce something in the 21st-century, there are several advantages to start coding education at a young age (Aytekin, Sönmez Çakır, Yücel & Kulaözü, 2018). Coding can be defined as a sequence of commands that instructs or enables the computer to perform the desired work (Anılan & Gezer, 2020; Bağra & Kılınç, 2021; Gültepe, 2018; Sırakaya, 2018). Coding is one of the essential skills for 21st-century literacy (Baz, 2018).

In the 21st-century, individuals are expected to have basic skills such as critical thinking, problem-solving, communication, cooperation, creativity, assertiveness, productivity, responsibility, and leadership. In addition; media literacy, information literacy, and technology literacy are among the basic thinking skills that individuals should acquire (Ceylan & Gündoğdu, 2018; Partnership for 21st Century Skills, 2011). One of the methods that should be used to help individuals acquire these skills is coding education (Anılan & Gezer, 2020; Akpınar & Altun, 2014; Keçeci, Alan & Zengin, 2016; Sayın, 2020; Shin, Park & Bae, 2013; Sırakaya, 2018). It is predicted that coding education, which has an important place in training individuals to use technology effectively, will be a major contributor to the modern workforce of the future (Gander et al., 2013; Hanbay Tiryaki & Balaman, 2020).

In coding education, different teaching approaches such as text-based coding, block-based coding, and robot-based coding are used (Bağra & Kılınç, 2021). In coding education, robots, games, applications, and block-based programming environments are usually used (Bocconi et al., 2016; Sayın, 2020). Especially in recent years, students are encouraged to learn coding from an early age thanks to the advantages of block-based programming environments in many countries. To this end, countries have updated their education systems and many activities and studies are being conducted on coding education (Sırakaya, 2018).

Studies in the literature indicate that cognitive thinking skills, motivation for instruction and academic achievement can increase in individuals with the help of coding education (Ceylan & Gündoğdu, 2018; Kaucic & Asic, 2011; Hanbay Tiryaki & Balaman, 2020; Wachenchauzer, 2004). In addition, coding education contributes to the development of individuals' problem-solving skills, creativity, and critical thinking skills (Anılan & Gezer, 2020; Baz, 2018; Fessakis, Gouli & Mavroudi, 2013; Özdinç & Altun, 2014). Considering these results, it can be said that coding education is important for the mental development of individuals (Akpınar & Altun, 2014). However, it can be stated that coding education requires a difficult and time-consuming process. The abstract and complex structure of traditional programming languages and the fact that it is a foreign language are among the obstacles encountered in coding education process (Keçeci, Alan & Zengin, 2016; Sırakaya, 2018). Moreover, it is very difficult, especially for young students, to understand abstract programming concepts (Sırakaya, 2018). However, there is still no consensus on what coding education should look like, what its benefits are, at what learning level it should begin, and how it should be integrated into the curriculum (Aytekin, Sönmez Çakır, Yücel & Kulaözü, 2018; Sayın, 2020). To make coding courses successful and fun, detailed research on the related topic and concrete data should be disclosed. Thus, it is important to provide coding training with different coding tools and to use the tools where the physical results of coding can be observed (Hanbay Tiryaki & Balaman, 2020; Kalelioğlu & Keskinkılıç, 2018). In addition, it is very important to choose programming languages that everyone enjoys and can learn without difficulty. These languages can create the necessary infrastructure to learn advanced programming (Sırakaya, 2018).

Nowadays, there are several applications and online platforms used in coding education that contribute to students' development. Some of them are Scratch, Code.org, CodeMonkey, CodeCombat, Mobil Kod (EBA), and mBlock. These applications, used specifically for children to learn the logic of programming, are entertaining, interesting, and engaging (Aytekin, Sönmez Çakır, Yücel & Kulaözü, 2018). In this study, these applications used in coding education are highlighted. In this context, this study aims to evaluate coding-based entertainment applications in the context of 21st-century skills. It is expected that the results of this study will contribute to the development of coding-based applications. In addition, the results of this study will provide researchers, educators, program developers, and policymakers with a roadmap and qualified data.

The Purpose of the Research

The purpose of this study is to assess teachers' opinions about coding-based entertainment applications in the context of 21st-century skills using the Many facet Rasch measurement model. In this context, the answers to the following questions were tried to be answered:

1. What is the general analysis of teachers' opinions and thoughts on coding-based entertainment applications in the context of 21st-century skills?
2. What is the analysis of item difficulty in the measuring tool related to the coding-based entertainment applications?

Method

This section of the study provides information about the research design, participants, and the research data. In addition, explanations of data collection and data analysis are provided.

Research Design

The research is a descriptive study conducted using the survey model. A survey model is a study that aims to collect data to determine certain characteristics of a group (Büyüköztürk et al., 2017). In this model, an attempt was made to explain what events and objects are to determine the current situation (Kaptan, 1998).

Participants

The participants of the research consist of 14 teachers working in different regions of Turkey. The teachers (raters) independently rated the entertainment applications based on coding using the 11-item rating form. The participants were informed about the study. Participation was based on volunteering. The teachers who participated in the study were asked to use the corresponding entertainment applications in their courses.

Research Data

According to the Rasch measurement model, this study has three facets. The first of these facets are teachers including 14 judges. The second facet is a criterion consisting of 11 items that capture teachers' opinions about coding-based entertainment applications in the context of 21st-century skills. The third one is the six coding-based entertainment applications that were assessed in the study. Thus, this study is based on the evaluation of the coding-based entertainment applications by 14 judges who consider certain criteria.

In the study, the entertainment applications were first identified. For this purpose, teachers who teach Information Technologies and work in different schools were interviewed. In this context, the teachers were asked to name the coding-based entertainment applications that they frequently use in their courses. Based on the teachers' responses, the preferred educational applications were identified and included in the evaluation. After deciding on the entertainment applications, the evaluation criteria were determined. In this context, the "Coding-Based Entertainment Applications Evaluation Form" was created by the researchers. A draft of 14 items was created for the form based on similar sources on the subject. The created form was reviewed by three academicians who are experts in their field, one academician who is an expert in the field of measurement and evaluation, and three teachers. As a result of the reviews, a total of 11 criteria (items) remained in the form. The Content Validity Ratio (CVR) of these criteria was calculated. This calculation was performed according to the technique of Davis (1992). For this technique, a minimum number of 3 and a maximum number of 20 experts are recommended. In this direction, the opinions of five experts were used in the present study. The experts considered the items regarding these four options: 1) "not relevant", 2) "somewhat relevant", 3) "quite relevant" and 4) "highly relevant" (Polit, Beck & Owen, 2007). The Content Validity Index (CVI) is the ratio between the number of experts who checked the number 3 and 4 options and the total number of experts. This value must be greater than 0.80 to be classified as "the item can pass the content validity test" (Doğan, Bulut & Çımrın, 2015). As a result of the calculations, it was found that the CVI of the research items was 89%. According to Veneziano and Hooper (1997), this value is statistically significant at the significance level of .05.

Analysis of the Data

The obtained data on the evaluation of entertainment applications were analyzed using the Many facet Rasch measurement model. The Rasch model was developed by John M. Linacre. This is a model that allows for the assessment of other sources of variability and that have the potential to influence test scores, such as the ability levels of the individuals, the difficulty levels of the items in the measurement instrument, and the raters, rubric, situation, task, and scoring criteria (Lynch & McNamara, 1998).

The data obtained were analyzed using the program FACETS 3.81.1 developed by Linacre (2007). The program FACETS usually contains three interfaces: Ability, Task, and Evaluator (Güler & Gelbal, 2010). Upon investigation, it was determined that the assumption of model-data fit was met to perform the analysis of the Many facet Rasch measurement model, and then the analyzes were carried out.

Results

In this part of the study, the results of each of the research questions are presented. In addition, this section presents the interpretations based on the literature by the results. In the current study, 14 judges evaluated six coding-based entertainment applications using 11 items. The 14 judges are the teachers who conducted the evaluation.

Figure 1 shows a general calibration map for coding-based entertainment applications using the Many facet Rasch measurement model. The calibration map shows the facets used in the research and general information about these facets. On these facets, the raters, the coding-based entertainment applications, and the criteria used to evaluate those applications are shown in separate columns. The logit measure on the left side of Figure 1 is the value between minus (-) and plus (+). This value is the same for each facet. These values are ordered by the quality of the facets included in the study. The criteria used in the evaluation of coding-based entertainment applications are arranged up from the most difficult to the easiest criterion, and the judges are from the most leniency to the most severity criterion. Further, coding-based entertainment applications are aligned with the highest quality at the top.

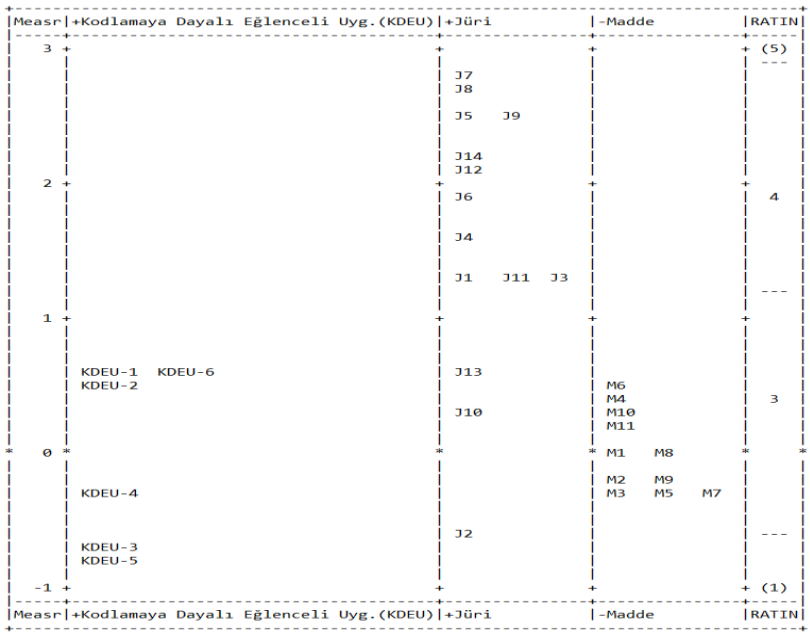

Figure 1. Data calibration map

When we examine the column of coding-based entertainment applications in the data calibration map, we find that the KDEU-1 (Scratch) and KDEU-6 (MBlock) applications are of high quality. On the other hand, the KDEU-5 (Mobil Kod) application was found to be of low quality. Also, we see that the rater J2 has the strictest rater behavior while the rater J7 has the most lenient rater behavior. Therefore, we can say that the raters have different rater characteristics.

When the column with the criteria (item) is examined, it is understood that the M6 (Developing in students an understanding of solidarity and benevolence) item is the most difficult one. On the other hand, it is found that M3 (Making students curious and interested in new developments), M5 (Teaching students to take responsibility), and M7 (Providing opportunities for students to learn by doing) items are the easiest items.

After analyzing the data on the calibration map, a detailed measurement report on the coding-based entertainment applications was prepared. The related report is presented in Figure 2.

Total Score	Total Count	Obsvd Average	Fair(M) Average	+ Measure	Model S.E.	Infit MnSq	Infit ZStd	Outfit MnSq	Outfit ZStd	Estim. Discrm	Correlation PtMea	Correlation PtExp	N Kodlamaya Dayalı Eğlenceli Uyg.(KDEU)
634	154	4.12	4.19	.64	.11	.98	-.1	.95	-.3	1.04	.71	.62	1 KDEU-1
632	154	4.10	4.17	.62	.11	.99	.0	1.01	.1	.98	.59	.62	6 KDEU-6
620	154	4.03	4.08	.46	.11	1.05	.4	1.06	.5	.87	.58	.63	2 KDEU-2
553	154	3.59	3.57	-.31	.10	.96	-.3	1.03	.3	1.03	.57	.62	4 KDEU-4
520	154	3.38	3.33	-.66	.10	.93	-.6	.91	-.8	1.10	.58	.61	3 KDEU-3
512	154	3.32	3.27	-.75	.10	.99	.0	.99	.0	1.01	.66	.60	5 KDEU-5
578.5	154.0	3.76	3.77	.00	.11	.98	-.1	.99	-.1		.61		Mean (Count: 6)
51.9	.0	.34	.39	.59	.00	.04	.3	.05	.5		.05		S.D. (Population)
56.8	.0	.37	.43	.65	.00	.04	.4	.05	.5		.06		S.D. (Sample)

Model, Populn: RMSE .11 Adj (True) S.D. .58 Separation 5.34 Strata 7.46 Reliability .97
Model, Sample: RMSE .11 Adj (True) S.D. .64 Separation 5.87 Strata 8.16 Reliability .97
Model, Fixed (all same) chi-square: 177.8 d.f.: 5 significance (probability): .00
Model, Random (normal) chi-square: 4.9 d.f.: 4 significance (probability): .30

Figure 2. Measurement report on the coding-based entertainment applications

When the results of the measurement report in Figure 2 was examined, it is seen that the reliability coefficient value is 0.97. This value shows the reliability with which the coding-based entertainment applications are classified. Furthermore, when examining the data, it can be seen that there are statistically significant differences between the coding-based entertainment applications (X^2=177.8; df=5; p=0.00<0.01). Also in the report in Figure 2, it can be seen that the Root Mean Square Standard Error (RMSE) value of the logit values of the characteristics of the coding-based entertainment applications is in the value of 0.11. In this context, it can be said that the calculated standard error value is quite low. In general, it can be stated that the coding-based entertainment applications used in the study are classified as KDEU-1 (Scratch), KDEU-6 (mBlock), KDEU-2 (Code.org), KDEU-4 (CodeCombat), KDEU-3 (CodeMonkey), and KDEU-5 (Mobil Kod) from high to low quality.

In order to give biased ratings when evaluating coding-based entertainment applications, it is seen that the tendency of raters has a negative impact on validity and reliability. In this context, it is important to determine the difference between rater severity and leniency behavior (rater bias) when evaluating coding-based entertainment applications. Based on this result, the present study also examined whether teachers exhibit rater bias when evaluating coding-based entertainment applications. The comparison between the raters' severity and leniency is shown in Figure 3.

Total Score	Total Count	Obsvd Average	Fair(M) Average	+ Measure	Model S.E.	Infit MnSq	Infit ZStd	Outfit MnSq	Outfit ZStd	Estim. Discrm	Correlation PtMea	PtExp	Nu	Jüri
291	66	4.41	4.46	2.78	.19	.69	-1.9	.77	-1.2	1.06	.27	.42	7	J7
288	66	4.36	4.42	2.67	.18	.96	-.1	.98	.0	.93	.29	.42	8	J8
283	66	4.29	4.34	2.51	.18	.96	-.2	1.00	.0	.90	.22	.44	9	J9
281	66	4.26	4.31	2.45	.17	.97	-.1	.94	-.3	1.15	.62	.44	5	J5
272	66	4.12	4.16	2.20	.17	1.43	2.4	1.40	2.2	.62	.48	.46	14	J14
270	66	4.09	4.13	2.14	.16	1.24	1.4	1.20	1.1	.80	.40	.46	12	J12
261	66	3.95	3.98	1.90	.16	1.07	.4	1.01	.1	.99	.63	.47	6	J6
250	66	3.79	3.80	1.63	.16	.45	-4.5	.46	-4.4	1.85	.76	.48	4	J4
237	66	3.59	3.58	1.31	.15	.77	-1.5	.77	-1.5	1.25	.58	.48	1	J1
237	66	3.59	3.58	1.31	.15	.84	-1.0	.83	-1.1	1.27	.42	.48	3	J3
235	66	3.56	3.55	1.27	.15	.81	-1.2	.81	-1.2	1.30	.68	.48	11	J11
206	66	3.12	3.09	.56	.16	1.03	.2	1.03	.2	.98	.22	.46	13	J13
195	66	2.95	2.92	.27	.16	1.15	.9	1.09	.5	.90	.43	.45	10	J10
165	66	2.50	2.47	-.61	.18	1.56	2.6	1.59	2.7	.49	.18	.40	2	J2
247.9	66.0	3.76	3.77	1.60	.17	.99	-.2	.99	-.2		.44		Mean (Count: 14)	
36.7	.0	.56	.59	.96	.01	.28	1.8	.27	1.7		.18		S.D. (Population)	
38.1	.0	.58	.61	.99	.01	.29	1.9	.28	1.8		.19		S.D. (Sample)	

Model, Populn: RMSE .17 Adj (True) S.D. .94 Separation 5.65 Strata 7.86 Reliability .97
Model, Sample: RMSE .17 Adj (True) S.D. .98 Separation 5.87 Strata 8.16 Reliability .97
Model, Fixed (all same) chi-square: 419.2 d.f.: 13 significance (probability): .00
Model, Random (normal) chi-square: 12.6 d.f.: 12 significance (probability): .40

Figure 3. Comparison of the severity/leniency of the juries

Examining the severity and leniency of the judges, it can be said that the judge with the code of J7 is the most lenient while the one with the code of J2 is the most severe. The analysis showed that the jury separation index is found to be 5.87, a value that is above the desired level (0.00 and close to 0.00). Furthermore, it can be seen in Figure 3 that the reliability coefficient is calculated to be 0.97. On the other hand, it was found that there is a significant difference between the severity and leniency of the juries (X^2=419.2; df=13; p=0.00<0.01). It was found that the evaluation in J7 was the most lenient with the value of 291 and the evaluation in J2 was the most severe with 165.

When the infit and outfit values of the plots in Figure 3 were evaluated, it was found that the judges coded as J4, J14, and J2 did not meet the criteria for infit and outfit (range 0.6 - 1.4). Thus, it can be said that the average of the infit and outfit squares of these juries falls outside the established limits. In other words, these judges do not show consistent rater behavior in evaluating coding-based entertainment applications. However, it can be said that the other judges (11 juries) are consistent in terms of scoring and thus the inter-rater reliability is high.

The study also examined the suitability of the criteria in the form used to evaluate coding-based entertainment applications. The statistical results on this subject are shown in detail in Figure 4.

Total Score	Total Count	Obsvd Average	Fair(M) Average	- Measure	Model S.E.	Infit MnSq	Infit ZStd	Outfit MnSq	Outfit ZStd	Estim. Discrm	Correlation PtMea	PtExp	Nu	Madde
291	84	3.46	3.43	.52	.14	.72	-2.1	.71	-2.1	1.31	.68	.66	6	M6
295	84	3.51	3.48	.43	.14	1.10	.7	1.12	.8	.85	.52	.66	4	M4
302	84	3.60	3.58	.29	.14	.96	-.2	1.07	.5	1.03	.61	.66	10	M10
306	84	3.64	3.64	.21	.14	1.11	.8	1.15	1.0	.82	.57	.66	11	M11
318	84	3.79	3.81	-.05	.15	.91	-.6	.92	-.4	1.07	.67	.66	1	M1
318	84	3.79	3.81	-.05	.15	1.04	.2	.99	.0	1.06	.73	.66	8	M8
324	84	3.86	3.90	-.18	.15	.88	-.7	.93	-.3	1.11	.65	.66	2	M2
327	84	3.89	3.94	-.24	.15	1.07	.5	1.08	.5	.83	.73	.66	9	M9
328	84	3.90	3.96	-.27	.15	.81	-1.3	.79	-1.4	1.24	.76	.66	7	M7
331	84	3.94	4.00	-.33	.15	1.02	.1	1.00	.0	.90	.62	.66	3	M3
331	84	3.94	4.00	-.33	.15	1.19	1.2	1.12	.7	.86	.67	.66	5	M5
315.5	84.0	3.76	3.78	.00	.15	.98	-.1	.99	-.1		.66		Mean (Count: 11)	
14.0	.0	.17	.20	.30	.00	.13	1.0	.13	1.0		.07		S.D. (Population)	
14.7	.0	.17	.21	.31	.00	.14	1.0	.14	1.0		.07		S.D. (Sample)	

Model, Populn: RMSE .15 Adj (True) S.D. .26 Separation 1.75 Strata 2.67 Reliability .75
Model, Sample: RMSE .15 Adj (True) S.D. .27 Separation 1.87 Strata 2.82 Reliability .78
Model, Fixed (all same) chi-square: 45.4 d.f.: 10 significance (probability): .00
Model, Random (normal) chi-square: 8.2 d.f.: 9 significance (probability): .51

Figure 4. Evaluation form analysis of coding-based entertainment applications

When the analysis results in Figure 4 are examined, it is seen that the separation index is found to be 1.75 and the reliability coefficient is as 0.75. The determined value of the reliability coefficient shows that the criteria (items) used in the research to determine the quality of coding-based entertainment applications are reliable. In addition, it was found that there is a significant difference between the criteria used to evaluate opinions about coding-based entertainment applications (X^2=45.4; df=10; p=0.00<0.01). The analysis result in Figure 4 also shows that the Root Mean Square Standard Error (RMSE) of the logit values of the criteria in the evaluation form is calculated to be as 0.15. The fact that this value is quite low was confirmed by calculating the adjusted standard error value (0.26) below the critical value (1.0). On the other hand, when the infit and outfit values of the facets in Figure 4 is considered, it is seen that all facets meet the criteria for infit and outfit. In this context, it is assumed that the relevant criteria are consistent in the evaluation of coding-based entertainment applications, that all criteria have acceptable usage properties, and that the average of the squares for infit and outfit is within the expected values.

Discussion

In the present study, teachers' opinions on coding-based entertainment applications were analyzed in the context of 21st-century skills using the Many facet Rasch measurement model. Basic skills such as critical thinking, communication, problem-solving, collaboration, and creativity are defined as 21st-century skills (Partnership for 21st Century Skills, 2011). These skills, which have no fixed content, change according to the conditions of the day (Sayın & Seferoğlu, 2016). Coding skill is also one of the 21st-century skills. It is mentioned in recent studies that some programs can increase the skills to find solutions to the problems encountered and the mistakes are easily noticed and solved (Aytekin, Sönmez Çakır, Yücel & Kulaözü, 2018). Coding courses designed to encourage students' computational thinking are becoming increasingly popular at the K-12 educational level (Göncü, Çetin & Top, 2018; Kafai & Burke, 2014). Especially in recent years, students are encouraged to learn programming from an early age thanks to the advantages of block-based programming environments in many countries. In the current study, Scratch, Code.org, CodeMonkey, CodeCombat, Mobil Kod (EBA), and mBlock, applications that make programming entertainment, were examined based on teachers' opinions.

The analysis showed that Scratch and mBlock applications, which are coding-based entertainment applications, had the highest quality. Scratch, a visual block-based programming application, is an application that is easy to learn in recent years and does not require writing code to teach programming logic effectively. Scratch, which is suitable for all ages and has been included in curricula in many countries, is a free application that can improve children's programming skills (Talan, 2020). The mBlock programming environment, on the other hand, is a combination of Scratch 2.0, Robotics, and Arduino platforms that provide visual programming support with a graphical interface (Numanoğlu & Keser, 2017). mBlock is a block-based programming program that, like Scratch, is based on drag-and-drop logic. By explaining the logic of programming to students, programming is not only more fun and easier but also gives them the skills to program and manage MakeBlock robots and Arduino kits (Haymana & Özalp, 2020).

On the other hand, the analysis revealed that the Mobil Kod application was ranked as the lowest quality. The Mobil Kod application was released as a block-based coding game designed for the acquisition of computer science and software courses in 5th and 6th grade. This application was developed to enable digital content and skill-based changes in the learning process. The Mobil Kod application was designed to support the development of students' algorithmic thinking (Yegitek, 2019).

When the information on teacher severity/leniency regarding coding-based entertainment applications were considered, it was found that the judge coded as J7 was the most leniency while the judge coded as J2 was the most severity. In addition, judges were found to be reliably ranked and differed in severity/leniency. It has been noted in the literature that in studies using the Many facet Rasch measurement model, the raters (juries) can sometimes be objective and sometimes biased (Baştürk, 2010; Batdı, 2014; Köse, Usta & Yandı, 2016; Semerci, 2012).

It was determined that the items in the coding-based entertainment application evaluation form used in the research serve the purpose. It was found that the item "Develop in students an understanding of solidarity and benevolence" was the most difficult item. Therefore, it can be said that the coding-based applications examined in the study may cause difficulties in developing students' understanding of solidarity and benevolence. In accordance with these results, it can be emphasized that the way coding-based applications can be used in developing students' understanding of solidarity and benevolence should be highlighted.

On the other hand, it was found that the items such as "Making students curious and interested in new developments", "Teach students to take responsibility", and "Providing opportunities for students to learn by doing" were the easiest to fulfill. It can be said that this coding-based entertainment application arouses students' curiosity and interest in new developments instead of making them boring and ordinary. It can be said that these coding-based applications arouse students' curiosity and interest in new developments instead of making them boring and ordinary. Teachers also stated that these practices teach students to take responsibility and allow them to learn through action and experience. The literature found that coding-based educational applications provide a simple, interesting, intriguing, and fun environment and opportunity for learning through doing (Çatlak, Tekdal & Baz, 2015; Talan, 2020). Children exposed to programming show more improvements in intellectual development, problem-solving skills, creative thinking, making connections between situations, learning by doing, and producing new ideas (Aksu, 2019).

In this study, teachers' opinions about certain coding-based entertainment applications such as Scratch, Code.org, CodeMonkey, CodeCombat, Mobil Kod (EBA), and mBlock were analyzed using the Many facet Rasch measurement model. In future research, further studies can be conducted by examining other aspects of applications than the applications examined in our study. Also, a qualitative or mixed-method can be used alongside quantitative methods to investigate the applicability and effectiveness of these concepts.

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