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Determining the Digital Literacy Levels and Opinions of Classroom Teachers attending eTwinning Activities*

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Abstract

The study aims to determine the digital literacy levels and opinions of classroom teachers who participated in eTwinning activities in Mersin province in the 2022-2023 academic year according to various variables. A mixed method was used in the study. The "Digital Literacy Scale" developed by Bayrakçı (2020) was used to collect quantitative data. The digital literacy scale consists of 6 sub-dimensions and 29 items: ethics and responsibility, general knowledge and functional skills, daily use, professional production, privacy and security, and social dimension. The research study group of the research consisted of 362 volunteer classroom teachers who participated in eTwinning activities working in Mersin province. The study's qualitative data of the study were collected through semi-structured interviews with 7 classroom teachers using the interview form prepared by the researchers and the data were analyzed by content analysis. Within the scope of the research, the digital literacy levels of classroom teachers who participated in eTwinning activities were found to be high. In the interviews, the teachers stated that the eTwinning activity improved their digital literacy skills. As a result of the research, teachers who participated in professional development courses were found to have higher DLS scores than teachers who did not participate in professional development courses. It was concluded that the DLS scores increased as the duration of being a member of eTwinning and the duration of using technological devices increased. According to the findings of the qualitative analysis, teachers stated that eTwinning activities contributed to recognizing and using Web 2.0 tools, knowing e-safety rules, developing online communication skills and improving digital literacy skills.

Keywords: eTwinning, digital literacy, classroom teacher.

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eTwinning Faaliyetlerine Katılan Sınıf Öğretmenlerinin Dijital Okuryazarlık Düzeylerinin ve Görüşlerinin Belirlenmesi*

Makale Türü	Başvuru Tarihi	Kabul Tarihi
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Öz

Bu çalışmanın amacı, 2022-2023 eğitim öğretim yılında Mersin ilinde görev yapan, eTwinning faaliyetlerine katılan sınıf öğretmenlerinin çeşitli değişkenlere göre dijital okuryazarlık düzeylerini ve görüşlerini belirlemektir. Araştırmada karma yöntem kullanılmıştır. Nicel verilerin toplanmasında Bayrakçı (2020) tarafından geliştirilen "Dijital Okuryazarlık Ölçeği" kullanılmıştır. Dijital okuryazarlık ölçeği; etik ve sorumluluk, genel bilgi ve işlevsel beceriler, günlük kullanım, profesyonel üretim, gizlilik ve güvenlik, sosyal boyut olmak üzere 6 alt boyut ve 29 maddeden oluşmaktadır. Araştırmanın çalışma grubunu Mersin ilinde görev yapan eTwinning faaliyetlerine katılmış gönüllü 362 sınıf öğretmeni oluşturmuştur. Araştırmanın nitel verileri araştırmacılar tarafından hazırlanan görüşme formu kullanılarak 7 sınıf öğretmeniyle yarı yapılandırılmış görüşme ile toplanmıştır ve veriler içerik analiziyle incelenmiştir. Araştırma kapsamında eTwinning faaliyetine katılan sınıf öğretmenlerinin dijital okuryazarlık düzeyleri yüksek bulunmuştur. Yapılan görüşmelerde öğretmenler eTwinning faaliyetinin dijital okuryazarlık becerilerini geliştirdiğini belirtmişlerdir. Araştırma sonucunda, mesleki gelişim kurslarına katılan öğretmenlerin katılmayan öğretmenlere göre DOÖ puanları daha yüksek bulunmuştur. Öğretmenlerin eTwinning'e üye olma süresi ve teknolojik cihazları kullanma süresi arttıkça DOÖ puanlarının arttığı sonucuna ulaşılmıştır. Nitel analiz bulgularına göre de öğretmenler, eTwinning faaliyetlerinin Web 2.0 araçlarını tanıma ve kullanma, e-güvenlik kurallarını bilme, çevrimiçi iletişim becerilerini geliştirme gibi katkıları olduğunu ve dijital okuryazarlık becerilerini geliştirdiğini belirtmişlerdir.

Anahtar Sözcükler: eTwinning, dijital okuryazarlık, sınıf öğretmeni.

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Introduction

The 21st century's rapid technological advancements have profoundly transformed education, politics, the economy, and social life, increasing communication and interaction. The European Commission's DigComp 2.2 (Digital Competence Framework for Citizens) report highlights the importance of digital skills in society and the workplace, emphasizing the need for digital literacy and citizenship among teachers and students. It underscores skills such as managing, evaluating, and utilizing information and data, alongside communication and collaboration through digital technologies (Vuorikari et al., 2022). Paul Glister (1997) defines digital literacy as "*the set of skills required to effectively use information presented in digital environments*". The European Union Council (2018) describes digital literacy as the ability to use digital technologies securely, critically, and ethically in learning, work, and societal interactions. This includes data management, effective communication, media literacy, creative content production, digital security and ethics, and high-level thinking skills like problem-solving and critical thinking (Duran & Özen, 2018).

Global initiatives aim to enhance digital skills in education by aligning with technological advancements. For instance, Spain's National Institute of Educational Technologies and Teacher Training (INTEF, 2017) and Turkey's General Directorate of Teacher Training and Development (2017) focus on integrating digital literacy and 21st-century skills. These efforts highlight the significance of global digital transformation and skill development. Supported by projects and standards like P21 (P21 Leadership States, 2017) and ISTE (International Society for Technology in Education, 2016) in the United States, these initiatives involve 33 institutions to help teachers use ICT effectively and teach critical thinking, problem-solving, and collaboration (UNESCO, 2018).

The Role of eTwinning in Teacher Education

eTwinning is an institutionalized collaborative learning environment where the educational community works on a common project through remote cooperation (Papadakis, 2016). Integrated into Erasmus+ since 2014, it has been Europe's largest e-learning platform since 2005, supporting collaboration and fostering digital literacy skills among teachers and students (eTwinning, 2022; Yamaç, 2018). It enhances global education by increasing cultural awareness and providing technological communication tools without needing face-to-face meetings (Camilleri, 2016). eTwinning aids teacher candidates with project-based teaching, interdisciplinary work, and soft skills development. It also promotes flexibility, innovation, peer collaboration, multiculturalism, and European and UNESCO values, offering students exposure to different cultures (İzgi Onbaşılı et al., 2022).

eTwinning enhances original expression, communication, entrepreneurial, mathematical, and social competencies (Döğer, 2022). It promotes cross-border collaboration, best practice sharing, and pedagogical skill enhancement, aiding digital transformation in education (Bal, 2019; Gheorghe, 2008; Huertas-Abril & Palacios-Hidalgo, 2023; Ürekli et al., 2024). eTwinning projects improve teachers' professional and personal development, teaching, cultural interaction, self-confidence, and language skills (Acar & Peker, 2024). Teachers use the platform for projects, online courses, professional growth, and collaboration, significantly benefiting both personally and professionally (Acar & Peker, 2021). The aim is high-quality education in Europe through collaboration and ICT integration (Crişan, 2013; Kaplan & Alkan, 2023; Paz-Albo & López, 2017; Prieto & Cirugeda, 2017).

Starting in Europe in 2005 and in Turkey in 2009, eTwinning activities have positioned Turkey as a leader in terms of schools, teachers, and projects (URL-1). The achievements of Turkish teachers in the European Awards in 2021 and the 2023-2024 academic year highlight Turkey's commitment to digital transformation (URL-2). This platform enhances Turkish teachers' digital literacy skills and promotes collaboration with European colleagues (Demir & Kayaoğlu, 2022; eTwinning Activity Introduction Brochure, 2019). Research shows eTwinning projects enhance teachers' digital literacy and ICT integration in education (Avcı, 2021; Gheorghe, 2008; Kampylis et al., 2013; Velea, 2011).

This study aims to contribute to the development of teacher training programs in Turkey by conducting an in-depth analysis of primary school teachers' digital literacy levels and their perspectives on these projects in Mersin province. In this context, the research problem has been identified as "*What are the digital literacy levels of classroom teachers participating in eTwinning activities and what are their perspectives?"* The following sub-problems have been addressed:

1) How are the digital literacy levels of classroom teachers participating in eTwinning activities?
2) Do the digital literacy levels of classroom teachers participating in eTwinning activities vary based on:
   - Their duration of membership on the eTwinning portal,
   - The duration of their usage of technological tools for eTwinning activities,
   - Their attainment of quality labels for eTwinning projects,
   - Their involvement as founders or partners in eTwinning projects,
   - Their participation in eTwinning professional development courses?
3) What are the views of classroom teachers participating in eTwinning activities regarding the contribution of eTwinning activities to digital literacy skills?

Method

Research Design

The study used a mixed methods approach, combining qualitative and quantitative research. This method involves collecting, analyzing, integrating, and interpreting both types of data within the same study (Tashakkori & Creswell, 2007). To determine the digital literacy levels of classroom teachers in eTwinning activities, a convergent parallel design was employed. This design diversifies, compares, and integrates data relevant to the research questions using both methods (Morse, 1991). As Teddlie and Tashakkori (2015) note, convergent parallel design combines the strengths of quantitative and qualitative methods for a holistic approach. In this design, neither method takes precedence (Yıldırım & Şimşek, 2018). Scores from the digital literacy scale were compared and integrated with interview responses, and the findings were evaluated. The convergent parallel design and research process are shown in Figure 1.

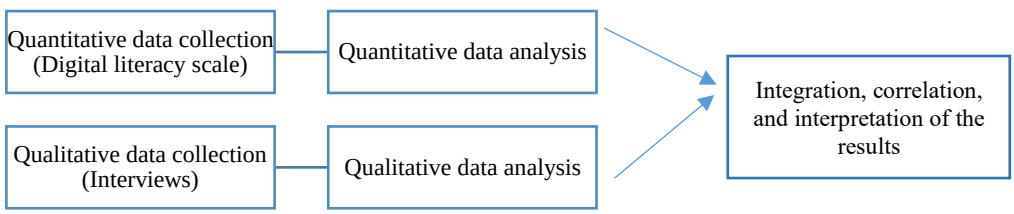

Figure 1: Research process according to the convergent parallel design

As shown in Figure 1, this study examined the digital literacy levels and views of teachers participating in eTwinning activities in Mersin province using a parallel convergent design with both quantitative and qualitative methods. Quantitative data from the "Digital Literacy Scale" and qualitative data from semi-structured interviews were analyzed simultaneously. Equal weight was given to both data types, aligning with the parallel convergent design.

Research Sample

The population of the quantitative dimension of the study consists of classroom teachers working in public and private schools in Mersin province during the 2022-2023 academic year. The sample of the study comprises 362 classroom teachers who participated in eTwinning activities. The demographic distribution of the participants involved in the study is presented in Table 1.

Table 1. *Information about the teachers participating in the quantitative dimension of the study*

		Number	%
Duration of Membership on the eTwinning Portal	0-1 year	70	19.3
	2-4 years	151	41.7
	5-10 years	138	38.1
	10+ years	3	0.8
Duration of Using Technological Tools for eTwinning Activities	0-1	213	58.8
	2-4	141	39
	5-7	7	1.9
	8 hours and more	-	-
Participation in eTwinning Projects	Founder	18	5
	Partner	216	59.7
	Both	124	34.3
	None	4	1.1
Attainment of Quality Labels for eTwinning Projects	National Quality Label	137	37.8
	European Quality Label	8	2.2
	Both	163	45
	None	54	14.9
Professional Development Courses Related to Digital Literacy	Participated	294	81.2
	Did not participate	68	18.8

Table 1 shows that 41.7% of classroom teachers have been eTwinning members for 2-4 years, and 38.1% for 5-10 years. Most teachers (58.8%) use technological tools for 0-1 hour daily. Regarding eTwinning projects, 59.7% have been partners, and 37.8% have earned a national quality label. Additionally, 81.2% have participated in digital literacy courses. These statistics highlight trends in membership duration, project roles, quality labels, and course participation.

The qualitative study involved 7 volunteer teachers, including a provincial coordinator, district representative, and vice principal, selected through purposive sampling based on eTwinning participation and quality label achievements (Büyüköztürk et al., 2020). Participants were coded as P1, P2, P3, etc., for confidentiality.

Research Instruments and Procedures

Digital Literacy Scale

For quantitative data collection, the "Digital Literacy Scale" by Bayrakçı (2020) was used. It has 6 sub-dimensions and 29 items, with scores ranging from 29 to 145 on a five-point Likert scale. The Cronbach's Alpha value for the study group is in Table 2.

Table 2. *The reliability values for the scale and its sub-dimensions*

	Reliability Coefficient	
	Cronbach's Alpha	**Total Number of Items**
DLS	0.934	29
Ethical and Responsibility	0.915	7
General Knowledge and Functional Skills	0.738	6
Everyday Usega	0.868	6
Professional Production	0.739	2
Privacy and Security	0.852	4
Social Dimension	0.651	4

When examining Table 2, it can be observed that the reliability values of the scale are high. The reliability values of dimensions, except for the social dimension, are above 0.70. The social dimension falls below this value. It is thought that the low number of items may lead to lower reliability.

Semi-Structured Interview Form

Qualitative data were collected through interviews, an effective method for capturing opinions, experiences, and emotions (Yıldırım & Şimşek, 2018). Researchers used a semi-structured interview form, refined through input from three experts and pilot testing. Questions included motivations for participating in eTwinning and measures taken for cybersecurity and copyright. Six face-to-face interviews were conducted. To ensure validity and reliability, all researchers helped prepare questions and analyze data. External validity was maintained by clearly defining data sources, and internal reliability was achieved by quoting data directly. The inter-rater agreement was 91%, calculated using the Miles and Huberman formula [(Agreement / (Agreement + Disagreement)) x 100], indicating reliable coding (Miles & Huberman, 1994).

Data Analysis

Prior to analyzing the data obtained from the "Digital Literacy Scale" within the scope of the study, the normality of the data was assessed using the Kolmogorov-Smirnov test and skewness-kurtosis values, and the results are presented in Table 3.

Table 3. *The results of the normality test for the DLS and its sub-dimensions.*

	DLS	**Ethical and Responsibility**	**General Knowledge and Functional Skills**	**Everyday Useg**	**Professional Production**	**Privacy and Security**	**Social Dimension**
Kolmogorov- Smirnov	.092	.186	.118	.174	.253	.234	.131
P	.000	.000	.000	.000	.000	.000	.000
Skewness	-0.047	-0.152	0.431	-0.308	0.751	0.055	0.265
Kurtosis	0.068	-1.210	-0.030	0.264	-0.490	-0.153	-0.021

According to Table 3, the skewness value is -0.047 and the kurtosis value is 0.068, both within the range of +1 to -1, indicating a normal distribution (Demir et al., 2016). With a sample size over 35, the Kolmogorov-Smirnov test was applied, and p-values of 0.00 for digital literacy and its sub-dimensions support normality at a 95% confidence level (Bayrakçı, 2020). Various statistical analyses were conducted using SPSS 22.0, including independent samples t-test, descriptive statistics, and one-way ANOVA, as the data were normally distributed.

In the qualitative phase, data from semi-structured interviews were analyzed using Miles and Huberman's (1994) model, which involves data reduction, display, and verification. After transcribing the interviews, the data were coded and visualized using "Word SmartArt". Consistency among researchers ensured coding accuracy, and inter-rater and researcher-participant verification processes validated the data.

Ethical Procedures

In this research, the principles of scientific research and publication ethics were followed. This research was organized in accordance with the permission of Mersin University Social and Humanities Ethics Committee dated 29.08.2022 and numbered 328.

Results

Quantitative Research Findings

The findings regarding the first sub-problem, "What are the digital literacy levels of classroom teachers participating in eTwinning activities?" are presented in Table 4.

Table 4. *Statistics and Levels Associated with the Digital Literacy Scale and Its Sub-Dimensions*

	DLS	**Ethical and Responsibility**	**General Knowledge and Functional Skills**	**Everyday Useg**	**Professional Production**	**Privacy and Security**	**Social Dimension**
$\bar{X}$	112.28	30.84	21.22	25.84	5.54	16.51	15.29
$\bar{X}$/k	3.87	4.40	3.53	4.30	2.77	4.12	3.82
Level	High	Very High	High	Very High	Middle	High	High

Participants showed a "very high" level of digital literacy in the "ethics and responsibility" and "daily use" sub-dimensions, a "high" level in "general knowledge and functional skills," "privacy and security," and "social dimension" sub-dimensions, and a "moderate" level in "professional production." Overall, participants had a high level of digital literacy according to the Digital Literacy Scale.

The data on whether digital literacy levels differ based on the duration of eTwinning membership was analyzed using one-way ANOVA, with results presented in Table 5.

Table 5. *Comparison of teachers' DLS and sub-dimension levels by eTwinning membership duration*

		KT	**Sd**	**KO**	**F**	**P**	**Significant Difference**
DLS	Between groups	5807.67	2	2903.83	14.611	0.00	(0-1 ile 2-4), (0-1 ile 5-10), (5-10 ile 2-4)
	Within groups	71350.45	359	198.74			
	Total	77158.12	361				
Ethical and Responsibility	Between groups	385.07	2	192.53	16.918	0.00	(0-1 ile 2-4), (0-1 ile 5-10),
	Within groups	4085.56	359	11.38			
	Total	4470.64	361				
General Knowledge and Functional Skills	Between groups	242.76	2	121.38	10.772	0.00	(0-1 ile 2-4), (0-1 ile 5-10),
	Within groups	4045.55	359	11.26			
	Total	4288.32	361				
Everyday Usega	Between groups	173.46	2	86.73	10.854	0.00	(0-1 ile 2-4), (0-1 ile 5-10),
	Within groups	2868.56	359	7.99			
	Total	3042.02	361				
Professional Production	Between groups	0.09	2	0.05	0.017	0.983	
	Within groups	1017.60	359	2.83			
	Total	1017.70	361				
Privacy and Security	Between groups	69.84	2	34.92	7.577	0.001	(0-1 ile 2-4), (0-1 ile 5-10),
	Within groups	1654.55	359	4.60			
	Total	1724.40	361				
Social Dimension	Between groups	105.54	2	52.77	11.539	0.00	(0-1 ile 2-4), (0-1 ile 5-10), (5-10 ile 2-4)
	Within groups	1641.83	359	4.57			
	Total	1747.37	361				

According to Table 5, there is no significant difference in the Professional Production levels of teachers ($F(2\text{-}359)=0.017$, $P>0.05$) based on their duration of eTwinning membership. However, significant differences were found in the Digital Literacy levels ($F(2\text{-}359)=14.611$, $P<0.05$), as well as in the sub-dimensions of Ethics and Responsibility ($F(3\text{-}358)=16.918$, $P<0.05$), General Knowledge and Functional Skills ($F(3\text{-}358)=10.772$, $P<0.05$), Daily Usage ($F(3\text{-}358)=10.854$, $P<0.05$), Privacy and Security ($F(3\text{-}358)=7.577$, $P<0.05$), and Social Dimension ($F(3\text{-}358)=11.539$, $P<0.05$) among teachers based on their duration of eTwinning membership. According to the results of the Tukey test conducted to determine which groups have differences between them, the digital literacy level of teachers who

have been members of eTwinning for 0-1 year ($\bar{X}$=105.07) is lower than that of teachers who have been members for 2-4 ($\bar{X}$=111.98) and 5-10 years ($\bar{X}$=116.19). Furthermore, the level of teachers who have been members for 2-4 years ($\bar{X}$=111.98) is lower than that of teachers who have been members for 5-10 years ($\bar{X}$=116.19). It can be concluded that as teachers' duration of eTwinning membership increases, their digital literacy levels also increase.

The data regarding the question of whether there is a difference in the digital literacy levels of classroom teachers participating in eTwinning activities based on their duration of using technological tools was analyzed using independent samples t-test, and the results are presented in Table 6.

Table 6. *Comparison of teachers' digital literacy and sub-dimension levels by duration of using technological tools*

	eTwining period	**N**	**$\bar{X}$**	**S**	**T**	**Sd**	**P**
DLS	0-1 hour	213	109.94	13.21	-3.71	360	0.000
	2 hours and above	149	115.63	15.86	-3.59	280.43	0.000
Ethical and Responsibility	0-1 hour	213	30.12	3.49	-4.80	360	0.000
	2 hours and above	149	31.87	3.29	-4.85	329.85	0.000
General Knowledge and Functional Skills	0-1 hour	213	20.62	3.14	-3.98	360	0.000
	2 hours and above	149	22.06	3.68	-3.87	285.15	0.000
Everyday Usega	0-1 hour	213	25.44	2.61	-3.18	360	0.002
	2 hours and above	149	26.41	3.18	-3.07	277.57	0.002
Professional Production	0-1 hour	213	5.29	1.57	-3.52	360	0.000
	2 hours and above	149	5.91	1.76	-3.45	294.80	0.001
Privacy and Security	0-1 hour	213	16.21	1.98	-3.16	360	0.002
	2 hours and above	149	16.94	2.39	-3.06	279.38	0.002
Social Dimension	0-1 hour	213	15.05	2.08	-2.49	360	0.013
	2 hours and above	149	15.63	2.32	-244	295.91	0.015

According to Table 6, the significant difference in the mean scores of teachers' Digital Literacy Scale (DLS) and its sub-dimensions based on "technological tool usage duration" was determined using an independent samples t-test. Teachers' digital literacy levels show a significant difference based on the duration of technological tool usage. Teachers who use technological tools for 2 hours or more (Mean = 115.63) have higher digital literacy levels compared to those who use them for 0-1 hour (Mean = 109.94).

The data regarding whether there is a variance in the digital literacy levels of classroom teachers participating in eTwinning activities based on their acquisition of quality labels from eTwinning projects, within the scope of the second sub-problem, was computed using one-way analysis of variance, and is presented in Table 7.

According to Table 7, there is no significant difference in teachers' levels of Professional Production ($F(2-359)=0.597$, $P>0.05$) based on their status of receiving quality labels. However, significant differences were observed in the levels of digital literacy ($F(2-359)=25.288$, $P<0.05$), Ethics and Responsibility ($F(3-358)=32.864$, $P<0.05$), General Knowledge and Functional Skills ($F(3-358)=14.003$, $P<0.05$), Everyday Usage ($F(3-358)=18.198$, $P<0.05$), Privacy and Security ($F(3-358)=10.538$, $P<0.05$), and Social Dimension ($F(3-358)=22.391$, $P<0.05$) sub-dimensions based on their status of receiving quality labels. According to the results of the Tukey test conducted to determine the differences between groups, the digital literacy level of teachers who received a national quality label ($\bar{X}$=109.64) was higher than those who did not receive any quality label ($\bar{X}$=103.29), but lower than those who received both national and European quality labels ($\bar{X}$=117.24). Additionally, the level of teachers who received both national and European quality labels ($\bar{X}$=117.24) was higher than those who did not receive any quality label ($\bar{X}$=103.29).

Table 7. *Comparison of mean levels of teachers' digital literacy scale (DLS) and its sub-dimensions based on quality label receipt*

		KT	Sd	KO	F	Sig.	Significant Difference
DLS	Between groups	9527.70	2	4763.85	25.28	0.000	(A-B), (A-C), (B-C)
	Within groups	67630.41	359	188.38			
	Total	77158.12	361				
Ethical and Responsibility	Between groups	691.84	2	345.92	32.86	0.000	(A-B), (A-C), (B-C)
	Within groups	3778.79	359	10.52			
	Total	4470.64	361				
General Knowledge and Functional Skills	Between groups	310,32	2	155.16	14.00	0.000	(A-B), (B-C)
	Within groups	3977.99	359	11.08			
	Total	4288.32	361				
Everyday Usega	Between groups	280.01	2	140.00	18.19	0.000	(A-B), (B-C)
	Within groups	2762.01	359	7.69			
	Total	3042.02	361				
Professional Production	Between groups	3.37	2	1.68	0.59	0.551	
	Within groups	1014.32	359	2.82			
	Total	1017.70	361				
Privacy and Security	Between groups	95.62	2	47.81	10.53	0.000	(A-C), (B-C)
	Within groups	1628.77	359	4.53			
	Total	1724.40	361				
Social Dimension	Between groups	193.79	2	96.89	22.39	0.000	(A-B), (A-C), (B-C)
	Within groups	1553.58	359	4.328			
	Total	1747.37	361				

The data regarding whether there is a difference in the digital literacy levels of classroom teachers engaged in eTwinning activities based on their involvement as founders or partners in eTwinning projects, as part of the second sub-problem, was analyzed using one-way analysis of variance (ANOVA) and is presented in Table 8.

Table 8. *Comparison of teachers' DLS levels by role in eTwinning projects*

		KT	Sd	KO	F	Sig.	Significant Difference
DLS	Between groups	7750.82	2	3875.41	20,263	0.000	Joint-Both
	Within groups	67895.20	355	191.25			
	Total	75646.02	357				
Ethical and Responsibility	Between groups	473.42	2	236.71	21,602	0.000	Joint-Both
	Within groups	3890.13	355	10.95			
	Total	4363.56	357				
General Knowledge and Functional Skills	Between groups	262.06	2	131.03	11.690	0,000	Joint-Both
	Within groups	3979.30	355	11.20			
	Total	4241.37	357				
Everyday Usega	Between groups	231.53	2	115.76	14.833	0.000	Joint-Both
	Within groups	2770.75	355	7.80			
	Total	3002.29	357				
Professional Production	Between groups	27.00	2	13.50	4.872	0.008	Joint-Both
	Within groups	983.86	355	2.77			
	Total	1010.87	357				
Privacy and Security	Between groups	59.29	2	29.64	6.466	0.002	Joint-Both
	Within groups	1627.66	355	4.58			
	Total	1686.95	357				
Social Dimension	Between groups	112.17	2	56.08	12.427	0.000	Joint-Both
	Within groups	1602.24	355	4.51			
	Total	1714.41	357				

According to Table 8, there is a significant difference in teachers' digital literacy levels (F(2-355)=20.263, P<0.05), as well as in the levels of Ethical and Responsibility (F(2-355)= 21.602, P<0.05), General Knowledge and Functional Skills (F(2-355)= 11.690, P<0.05), Daily Use (F(2-355)= 14.833, P<0.05), Professional Production (F(2-355)=4.872, P<0.05), Privacy and Security (F(2-355)= 6.466, P<0.05), and Social Dimension (F(2-355)= 12.427, P<0.05) based on their status as founders or partners in eTwinning projects. According to the results of the Tukey test conducted to determine the differences between the groups, the digital literacy level of teachers who are both founders and partners in eTwinning projects (Mean = 118.54) is higher than that of teachers who are only partners (Mean = 108.70).

The data regarding whether there is a difference in the digital literacy levels of classroom teachers participating in eTwinning activities based on their participation in digital literacy professional development courses, within the scope of the second sub-problem, was computed using an independent samples t-test and is presented in Table 9.

Table 9. *Teachers' levels on digital literacy and its sub-dimensions by participation in professional development courses*

	Participation Status	**N**	**$\bar{X}$**	**S**	**Sd**	**T**	**P**
DLS	Participated	294	114.64	12,89	360	6,77	0,000
	Did not participate	68	102.07	17,14			
Ethical and Responsibility	Participated	294	31.32	3,28	360	5,55	0,000
	Did not participate	68	28.79	3,79			
General Knowledge and Functional Skills	Participated	294	21.50	3,27	360	3.24	0.001
	Did not participate	68	20.01	3.89			
Everyday Usage	Participated	294	26.26	2.66	360	5.98	0.000
	Did not participate	68	24.02	3.20			
Professional Production	Participated	294	5.46	1.68	360	-1.99	0.047
	Did not participate	68	5.91	1.63			
Privacy and Security	Participated	294	16.77	2.03	360	4.83	0.000
	Did not participate	68	15,39	2.45			
Social Dimension	Participated	294	15,53	2.05	360	4.32	0.000
	Did not participate	68	14.27	2.52			

According to Table 9, teachers' digital literacy level (t(360)= -6.779, p<0.05), as well as their scores on ethical and responsibility dimension (t(360)= -5.557, p<0.05), General Information and Functional Skills (t(360)= 3.245, p<0.05), Daily Use (t(360)= 5.985, p<0.05), Professional Production (t(360)= -1.996, p<0.05), Privacy and Security (t(360)= 4.830, p<0.05), and Social Dimension (t(360)= 4.329, p<0.05) sub-dimensions exhibit a significant difference based on their participation status in professional development courses. The digital literacy level of teachers who participated in professional development courses (M = 114.64) is higher compared to those who did not participate (M = 102.07).

Qualitative Research Findings

The qualitative findings regarding the third sub-problem of the research, "What are the opinions of classroom teachers participating in eTwinning activities regarding the contribution of eTwinning activities to digital literacy skills?" are presented below. The responses provided by the participating teachers to the questions posed through the semi-structured interview form were subjected to content analysis. The results were organized into categories and codes, and visualized using "Word SmartArt."

Figure 2 depicts the participants' responses regarding using digital technologies in the eTwinning process.

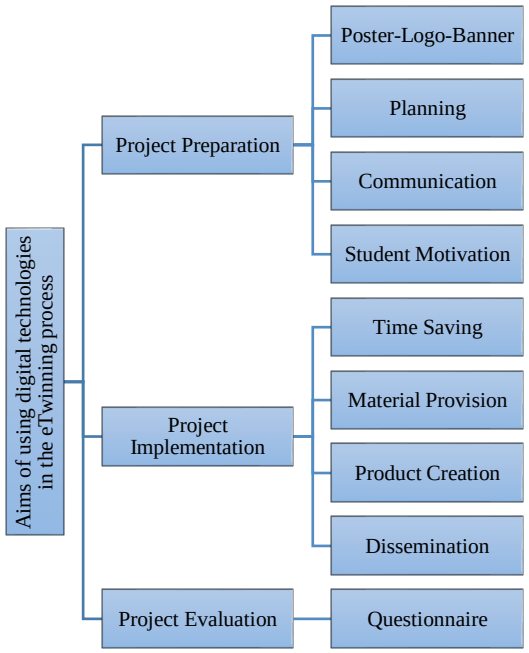

Figure 2. *Purposes of utilizing digital technologies in the eTwinning process*

Figure 2 shows that participants used digital technologies in the eTwinning process for various purposes: motivating students during project preparation, creating posters, logos, and banners, facilitating communication among project partners, and planning the project process. During project implementation, digital technologies were used to develop project products, disseminate the project, and evaluate it through questionnaires. Here are some participants' opinions:

> *T2: "I use digital technologies to prepare posters and logos for project promotion, to create project student activity products, to make acquaintance, activity planning and evaluation meetings and to carry out dissemination efforts of our project."*

Figure 3 depicts the participants' response to the question, "Have you created a social media account, website, or blog page for your eTwinning projects? If so, what purposes do you use them for?" Their responses regarding what they consider when preparing these platforms were also included and analyzed.

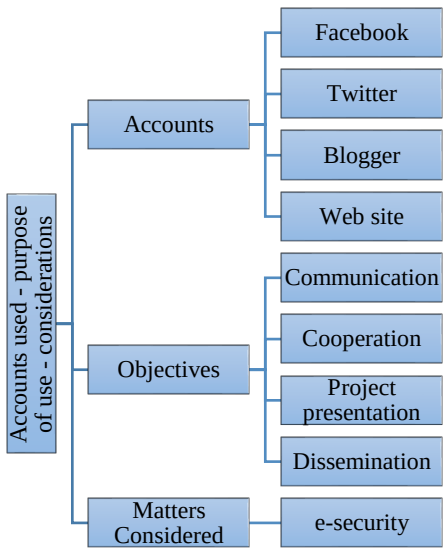

Figure 3. Accounts used - purpose of use - considerations

Figure 3 shows that all classroom teachers in the study created social media accounts, websites, or blog pages for their projects. They used these platforms for communication, collaboration, promotion, and dissemination. Teachers emphasized following e-safety rules and avoided sharing students' faces and personal information in their posts. Here are some participants' opinions:

> *T7: "I prepared Facebook. I used it to communicate easily with my stakeholders and to make fast and effective posts. I pay attention to e-safety rules in my posts. I do not share private information and photos where students are recognizable."*

Figure 4 displays the responses of the participants to the inquiry regarding the precautions taken in terms of cybersecurity and copyright when sharing their eTwinning-related activity products on the internet, which were subsequently assessed.

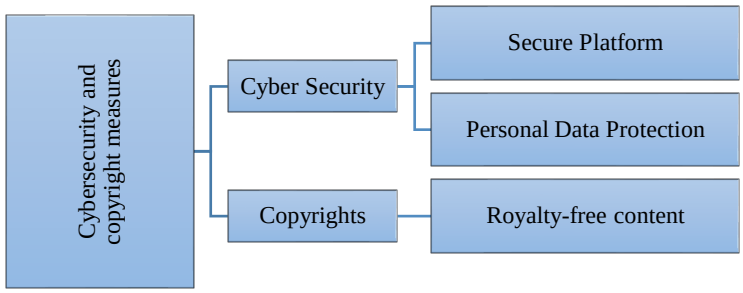

Figure 4. *Cybersecurity and copyright measures*

Figure 4 shows that teachers emphasized cybersecurity and copyright precautions, such as using secure platforms, safeguarding personal data, and choosing royalty-free content when sharing eTwinning activity products online. Here are some participants' opinions:

> *T2: "I pay attention to sharing on secure platforms. I do not use copyrighted content such as pictures, videos, music, etc. I get permission from the product owner for the products I have to use."*

Figure 5 illustrates the responses of the participants regarding whether they believe eTwinning activities contribute to their digital literacy skills. Their answers to the question "What kind of contributions, in which areas?" were included and analyzed.

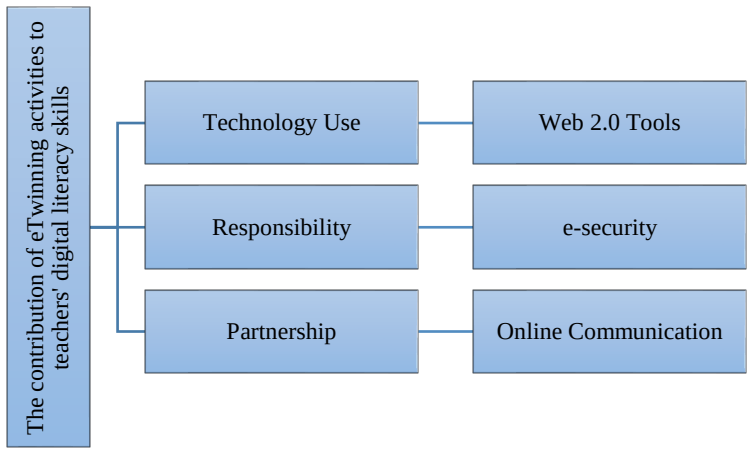

Figure 5. The contribution of eTwinning activities to teachers' digital literacy skills

Figure 5 shows that all participants recognized the contribution of eTwinning activities to their digital literacy. They noted that eTwinning helped them identify and use Web 2.0 tools, improve e-

safety practices, enhance online communication, and boost overall digital literacy. Here are some participants' opinions:

> *T7: "We need digital resources to communicate with our project partners from different countries, cities and schools. This situation helped me to improve myself in using digital tools. I learned to use different Web 2.0 tools to prepare our activities. I also learned to be a good guide to my students about e-security."*

Figure 6 shows the participants' question 'What kind of content do you create digitally in your eTwinning projects? The answers they gave to the question were included and the answers were evaluated.

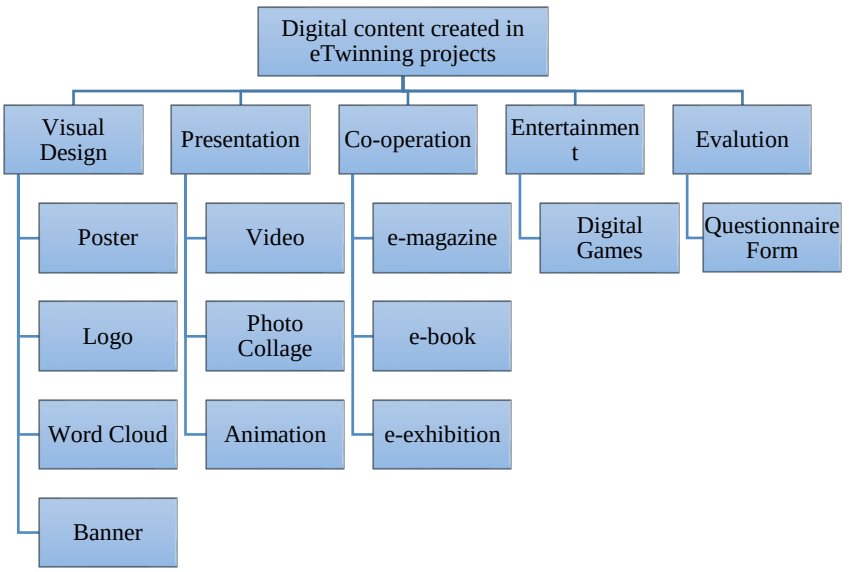

Figure 6. *Digital content created in eTwinning projects*

Figure 6 shows the digital contents created by the participant teachers in eTwinning projects. Some of the views of the participants are as follows;

> T1: "*When starting projects, I usually prepare posters. I prepare and present project activities with video and animation tools. With the story creation activities, we prepared with our students, I am preparing an e-book. Especially during the student introduction webinars, I prepare digital games at different times of the project. I also prepare questionnaires to decide on and evaluate project activities. Especially during the pandemic period, we disseminated the project activities by preparing an e-exhibition.*"

The qualitative findings provide deep insights into classroom teachers' views on eTwinning activities' impact on their digital literacy. Teachers stated that eTwinning improved their use of digital technologies, introduced new Web 2.0 tools, and enhanced their project preparation, implementation, and evaluation. They became more aware of cybersecurity and copyright issues on digital platforms. Participants noted significant advancements in creating digital content, including visual design, interactive presentations, and digital publishing. They used digital tools to create posters, logos, interactive e-books, digital games, and surveys for activity evaluation. Additionally, they utilized e-exhibitions and e-magazines to disseminate their projects.

Discussion, Conclusion and Recommendations

The study revealed that classroom teachers involved in eTwinning activities have a high average digital literacy score of 112, with an arithmetic mean of 3.87, indicating proficiency in digital literacy and the effectiveness of eTwinning in enhancing educators' digital skills. Supported by qualitative findings, the research shows that teachers effectively use digital technologies during eTwinning, create content on various digital platforms, and are aware of cybersecurity and copyright issues. The literature review supports that eTwinning enhances teachers' digital skills and internet security awareness

(Gökbulut, 2023; Özçakır, 2023). Additionally, eTwinning projects improve teachers' and students' language skills, ICT usage, and motivation, fostering healthy relationship-building skills (Demir & Kayaoğlu, 2022).

There is a significant relationship between teachers' duration of eTwinning membership and their digital literacy scores, excluding the professional production dimension. Professional production is considered an advanced aspect of digital literacy, necessitating specialized training. Teachers with long-term eTwinning memberships scored higher on the total scale and social dimension compared to others. Scores for ethics, general knowledge, and functional skills, as well as daily usage, were higher for teachers with 5-10 years of membership compared to those with 0-1 year, suggesting that longer eTwinning usage increases digital literacy (Erdem et al., 2021).

Comparing teachers' digital literacy levels with their durations of eTwinning membership and technological tool usage indicates that long-term technology usage positively influences digital literacy. These results show that teachers enhance their digital skills and create effective digital content using Web 2.0 tools during eTwinning. These findings align with Yazgan (2022), emphasizing eTwinning's contribution to teachers' technology usage skills. Other research indicates that eTwinning projects improve student-centered learning and ICT competencies, strengthening digital skills for both students and teachers (Avcı, 2021; Crisan, 2013; Gençtürk Erdem et al., 2021).

Significant differences in teachers' digital literacy levels were observed based on their acquisition of quality labels. Teachers with quality labels had higher digital literacy levels compared to those without. Keleş (2022) found that these teachers had higher technology usage attitudes than eTwinning novices. Döğer and Kurnaz (2022) noted that teachers with quality labels and more project experience used technology better, suggesting that quality label criteria positively influence digital literacy. Comparing teachers' levels on the Digital Literacy Scale (DLS) based on their roles as founders or partners in eTwinning projects revealed significant differences. Those who were both founders and partners scored significantly higher on the total scale and all sub-scales than those who were only partners. Teachers who participated in digital literacy professional development courses also had significantly higher levels.

Qualitative analysis revealed that teachers first learned about eTwinning through colleagues and district promotion meetings. They became members due to the portal's interesting features and its contributions to professional development and student learning. Teachers create social media accounts, blogs, and websites to collaborate, communicate, and disseminate projects. Using copyright-free images and videos, avoiding students' visible faces online, and protecting personal data increase teachers' digital literacy. Creating digital content with Web 2.0 tools significantly enhances digital literacy through eTwinning, consistent with Gençtürk Erdem et al. (2021).

The literature review shows classroom teachers' digital literacy levels vary widely, with technology integration into teaching being a critical area. Studies highlight a range of digital literacy levels (Atmojo et al., 2022), the roles of school leaders and teachers in developing digital literacy (Suwarto et al., 2022), and the importance of digital literacy for teacher candidates (Prachagool et al., 2022). Sadaf and Gezer (2020) noted that teachers see digital literacy as crucial for equipping students with 21st-century skills, with positive attitudes, perceived benefits, and self-efficacy influencing their intentions to integrate digital literacy. Teachers' digital literacy practices and attitudes toward technology use are linked to student responses (Kurniawati et al., 2018; Yanuarto & Jaelani, 2021). Studies also reflect on teachers' readiness for online teaching (Saud, 2021), emphasizing the importance of continuous professional development.

The research recommends organizing regular professional development courses and workshops to enhance teachers' digital literacy. Experimental studies could evaluate digital platforms like eTwinning among different teacher groups. Teachers can strengthen students' digital literacy by enriching teaching materials with digital technologies and developing programs to increase students' awareness of digital security and ethics. School administrations should provide infrastructure and resources to encourage international collaboration platforms, and researchers should examine their effectiveness and impact on student achievement.

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