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The Role of Digital Education in Reducing the Risk of Cyberbullying Among Female Secondary School Students From their point of view in Riyadh - Saudi Arabia

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Abstract: The research aims to identify the role of digital education in improving female secondary school students' ability to confront cyberbullying dangers, recognize its different patterns, and explore ways to reduce its effects and repercussions. To achieve the research objectives, the study relied on a quantitative descriptive method to process the primary data collected through a 46-item questionnaire divided into four main dimensions. The questionnaire was distributed to a research sample of 390 female secondary school students, who were chosen randomly and systematically. The research yielded significant results at the level of the first dimension, which addressed the current reality of digital education for secondary school students. The mean values ranged between 2.75 and 2.83. As for the second dimension, which focused on forms of electronic bullying, the mean values ranged between 4.03 and 4.24. The third dimension dealt with the effects of cyberbullying, with mean values ranging between 3.99 and 4.34. The last dimension examined expressions reflecting the means and mechanisms for activating the role of digital education in addressing cyberbullying issues. The mean values ranged between 4.29 and 4.49. The high mean values across all dimensions indicate a strong degree of agreement among the research sample members regarding the questionnaire's dimensions. Based on the study results, the researchers recommended increasing female students' awareness of cyberbullying and adopting modern strategies to confront electronic bullying. They also suggested activating the role of the media in raising both female students' and the community's awareness of this phenomenon and its various repercussions. Additionally, the study emphasized the importance of increased coordination and cooperation between families and schools in monitoring and addressing cyberbullying.

Keywords: Digital Education – cyberbullying - secondary school female students - Effects of bullying - forms of bullying.

1 Introduction

The emergence of cyberbullying is due to the rapid growth of electronic communication methods, which now include platforms like WhatsApp, Instagram, Snapchat, Facebook, and Twitter alongside traditional internet and telephone communication. Cyberbullying is a more severe and widespread form of bullying that occurs through modern technologies [1]. It is defined as intentional and repeated harm inflicted through computers, smartphones, or other electronic devices [2]. This type of bullying can be carried out by known or unknown individuals and can involve electronic harassment, defamation, deception, and threats [3]. Recent studies have confirmed that cyberbullying is a global concern for internet users [4]. Despite the numerous advantages of electronic communication, some individuals misuse these tools, this study aligns with previous research by Ratliffe & Mark (2011) [5] and Slonje, et al., (2012) [6], which identified social networks and cell phones as the main channels for electronic bullying. Rice et al. (2015) [7] discovered that cyberbullying often occurs on Facebook and through text messages. Alwan (2016) [8] found that 6.32% of participants reported traditional bullying in their schools, with cyberbullying being the most prevalent form, primarily via text messages. Additionally, 6.14% of respondents identified as both traditional and electronic bullies.

School students are highly sensitive and significantly impacted by modern technologies, making them more vulnerable to both the positive and negative aspects of the internet. While technology can assist in learning and adaptation, it may also lead to immersion in the virtual world and hinder the development of essential learning skills. Cyberbullying, one of the most pressing issues facing schools, has become a societal concern due to its negative effects [9], [10].

Research on cyberbullying has increased, with Rigby (2007) [11] illustrating its long-term negative effects on both the bully and the victim. Cowie (2013) [12] reported that low academic performance, low self-esteem, and a constant sense

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of isolation are some of the most significant negative impacts of bullying. Willard (2007b) [13] and Magliano (2013) [14] added that it results in a lack of self-confidence and can lead to antisocial behaviors, such as alcohol and drug abuse, and depression.

This research aims to explore the role of digital education in enhancing female secondary school students' resilience against cyberbullying. Bouderbala (2020) [15] found that digital education positively influences conscious behavior and helps eradicate illiteracy, while Al-Hamdani (2020) [16] emphasized its importance as a modern necessity requiring further development.

2. Research Problem

Cyberbullying impacts adolescents due to their frequent use of modern technologies, resulting in increased occurrences of this behavior [17]. Negative effects of cyberbullying include school insecurity [18], poor parental relationships [19], moral deviance [20], depression [19], anxiety [21], and fear and sadness [22], [23]. Research shows that cyberbullying starts in primary education, peaks in middle school, and declines towards the end of secondary education [24].

Healy and Lynch (2013, p. 104) [25] found that 65% of students in Dublin, Ireland, experienced cyberbullying. In a US study across six geographically diverse schools, Kowalski and Limber (2007, p. 25) [26] reported that 3.8% of primary school students and about 11% of middle school students faced cyberbullying at least once every two months. Magliano (2013, p. 57) [14] confirmed the prevalence of cyberbullying among adolescent students in Pennsylvania, USA, with most victims being female. Mark and Ratliffe (2011, p. 96) [5] showed that increased internet usage led to more cyberbullying incidents in Hawaii, primarily involving females (56%). Pilkey (2011) [27] found that 37.8% of middle school students in Texas experienced cyberbullying, and 56% observed and reported such incidents. A US National Council for Crime Prevention survey revealed that 43% of students encountered cyberbullying [28]. In Ankara, 41.3% of middle school students faced cyberbullying via text messages, while in Jakarta, Indonesia, 80% of adolescent students reported occasional electronic threats [29].

Cyberbullying is associated with adolescents' ability to access technology using electronic devices [30], which have become an essential part of their lives. The adolescent period is characterized by various changes in physical, psychological, and mental aspects, with cyberbullying being closely linked to the psychological aspect [31]. Some of the problems associated with this stage include self-concept, identity search, rebellion, despair, emotional fluctuations, addiction, and delinquency [8], [32].

Cyberbullying is linked to adolescents' use of electronic devices, which are now an essential part of their lives. This stage of life involves various physical, psychological, and mental changes, with cyberbullying closely tied to the psychological aspect. Issues associated with adolescence include self-concept, identity search, rebellion, despair, emotional fluctuations, addiction, and delinquency.

Research has investigated cyberbullying among adolescent students. Hussein (2016) [33] studied a sample in Giza Governorate, Egypt, finding saturation in four factors: concealment, slander, stalking, and electronic harassment. Bakkar (2017) [34] discovered that among students aged 10-14, 42% experienced online harassment, 35% faced threats, and 58% received obscene and harmful messages.

Education about cyberbullying is crucial, and digital education helps individuals become intellectually and emotionally prepared to interact with technology. This is achieved through education at various stages, promoting desired behaviors. Students' insights, rooted in their sense of responsibility towards themselves and others, influence their judgments on behaviors and issues. Understanding students' perceptions of cyberbullying is vital for accurate results, gathering information about the problem, and identifying preventative measures and solutions.

Cyberbullying presents a significant challenge to electronically connected individuals and societies, affecting educational programs and policymakers. The research problem focuses on the psychological, social, and educational effects on all parties involved, such as families, societies, and students. This calls for an examination of digital education's role in enhancing female secondary school students' ability to confront cyberbullying by addressing specific questions.

1. What is the reality of digital education among female secondary school students from their perspective in Riyadh, Saudi Arabia?
2. What are the forms of electronic bullying on electronic websites and applications from these students' viewpoint?
3. What are the negative effects of bullying on its victims from these students' perspectives?
4. What are the strategies for dealing with cyberbullying from these students' perspectives?

3. Research Objectives

1. Identifying the reality of digital education in confronting the phenomenon of bullying from the point of view of female secondary school students in Riyadh, Saudi Arabia.
2. Identifying the forms of cyberbullying on electronic websites and applications from the point of view of female secondary school students in Riyadh.
3. Identifying the negative effects of the phenomenon of cyberbullying on the bullied victims from the point of view of these students.
4. Identifying the appropriate mechanisms to deal with the phenomenon of cyberbullying from the point of view of these students.

4. The Applied and Theoretical Significance

1. The research holds theoretical importance due to the significance of the subject and the negative effects of cyberbullying on all parties involved, as well as the relative lack of Arab studies on the topic.
2. It focuses on a selected sample of female secondary school students in Riyadh, Saudi Arabia, considering the rapid progress in information technology and its potential exacerbation of the problem's negative repercussions.
3. The research benefits website and electronic application managers by aiding in the formulation of rules and regulations for optimal use of information technologies and supports educational institutions in developing effective mechanisms to address cyberbullying.
4. It aims to raise family awareness of cyberbullying, its causes, and negative effects, providing knowledge and methods to reduce its occurrence and mitigate its impact, particularly for children.
5. Additionally, the research clarifies the role of digital education in empowering female secondary school students to confront cyberbullying and reduce its negative consequences.

5. Research Terminologies

Digital education:

The researcher defined it procedurally as a set of values, skills, norms, knowledge, and rules of behavior related to the use and dealing with different virtual technologies and digitals in a way that makes it a good tool for accomplishing the tasks and activities that people practice on the practical, scientific, and social sides.

Cyberbullying:

The researcher defines it procedurally as an intentionally aggressive behavior practiced by a person whose identity is hidden, and which appears among female secondary school students to cause harm to female colleagues.

The secondary stage: It is the stage that follows the intermediate stage and precedes the university stage, as it moves a person from his adolescence towards his maturity.

6. Theoretical Framework

The theoretical framework comprises the following elements:

- **Concept of cyberbullying:** Cyberbullying has been extensively studied, with various definitions proposed. According to Hinduja & Patchin, (2015) [2], cyberbullying involves the intentional and repetitive infliction of harm using electronic devices such as computers and mobile phones. Willard (2007) [13] defines it as the act of treating others violently by sending harmful materials using technology.
- **Concept of digital education:** Umm Al-Rutam (2019, p. 91) [35] asserts that digital education aims to equip students with the necessary skills to navigate the digital revolution, comprehend its impact on their lives and societies, and utilize digital resources safely and effectively. It involves the development of critical thinking abilities in relation to digital technologies and networks, guided by educators and students, or parents and children. This encompasses the practical utilization of digital resources and technologies to foster skills and behaviors that enable individuals to become responsible digital citizens, engaging with others both directly and within educational contexts.
- **Forms of cyberbullying:** Cyberbullying manifests in various forms, including harassment, defamation,

representation, dissemination of sensitive information, deception, deportation or exclusion, and electronic stalking. These forms occur through the utilization of text messages, pictures, videos, mobile phones, phone calls, emails, chat rooms, instant messaging, websites, and blogs.

- **Personal characteristics of the bully:** The personal characteristics of individuals engaging in bullying behavior encompass multiple traits. Notable characteristics include anonymity, electronic competence, lack of empathy, home background, adolescent immaturity, intentional harm, and strength of character.
- **Personal characteristics of the bullied:** Individuals who experience bullying exhibit specific personal characteristics, including vulnerability, low self-esteem, a desire for social approval, avoidance of technology, isolation, and a lack of support [36].
- **Reasons for cyberbullying:** Multiple factors contribute to the occurrence of cyberbullying. These reasons vary and include desires for revenge, exposure to violent media, family upbringing, the ability to hide one's identity, avoidance of punishment, power dynamics, domestic and societal violence, boredom and pleasure-seeking, easy access to communication methods, and a lack of commitment to ethical and behavioral standards.
- **Effects of cyberbullying:** Cyberbullying impacts both victims and perpetrators, with effects including psychological and physical consequences, as well as potential implications for academic achievement and moral development. Recent literature suggests that bullies face increased risks due to psychological, social, and behavioral problems, making them vulnerable to aggressive behaviors like rule-breaking tendencies, delinquency, and low self-esteem, all of which have been associated with email-related cyberbullying [2], [19].
- **Preventive measures to reduce cyberbullying** encompass various approaches, including interventions in schools and families, technological solutions, and prevention programs such as the ISafe program and the Kiva program.

Digital education is significant for several reasons, such as creating opportunities for students to establish positive online personas, fostering respect and responsibility, ensuring safety in digital participation, and protecting individuals from cyberbullying. It also plays a crucial role in preventing bullying, safeguarding human rights, and cultivating awareness among students. Furthermore, digital education enhances awareness, intelligence development, knowledge acquisition, effective communication skills, and responsible technology use while respecting human rights and dignity.

- Digital education tools encompass various aspects, such as the protection of identity and information through defining the importance of security and privacy, the ability to identify and avoid deception and false news, and the necessity of acting wisely in the digital environment. Additionally, comprehensive awareness is crucial, including understanding the potential consequences of actions, knowing individual and others' rights, and being aware of legal implications [37], [38].
- Dimensions of digital education encompass guidelines and laws promoting positive digital experiences, fostering knowledge of the impact of actions on others, facilitating constructive participation, and ensuring equitable access to technology [39]. Included dimensions are digital access, commerce, communication and collaboration, etiquette, fluency, health and well-being, law, rights and responsibility, and security and [40], [41].
- The stages of teaching digital education involve teaching balance in screen time and smart choices, instructing safety measures to protect privacy and avoid sharing passwords, educating about anti-bullying strategies, fostering responsibility in gathering credible information and responding to bullying, and addressing the concept of the digital footprint and online presence [42].

7. Literature Review

In this section, we will review and discuss several relevant previous studies as the following:

Ratliffe and Mark (2011) [5] sought to determine the prevalence of cyberbullying among middle school students and examine the relationship between school type, gender, grade, and bullying in a sample of 247 male and female students. The researchers discovered that 33% of females and 20% of males were victims of cyberbullying, with social networks and cell phones being the most common mediums. Additionally, a non-linear relationship was found between internet usage and cyberbullying rates, as well as students' perceptions that teachers and parents were inadequately equipped to help resolve cyberbullying issues.

Slonje, et al., (2012) [6] demonstrated that cyberbullying, which occurs electronically through computers or smart devices, is a significant issue among the younger generation. Males were found to engage in cyberbullying more than females, who were typically victims rather than perpetrators. Common methods included text messages, emails, phone calls, and chat rooms, as well as the exchange of photos and videos.

Rice et al., (2015) [7] sought to uncover the relationship between gender, race, and identity in technology usage, as well as the patterns, behaviors, and experiences of 1,285 middle school students in Los Angeles concerning cyberbullying. The findings indicated that 6.6% of students were victims of cyberbullying, with 0.5% being bullied. Cyberbullying frequently occurred on Facebook or through text messages, and students from sexual minorities were more likely to be targeted.

Alwan (2016) [8] investigated the prevalence and nature of bullying among third-grade intermediate and secondary students in Abha city, examining both traditional and electronic bullying. The study found that 6.32% of respondents believed traditional bullying occurred at a rate of 1.39%, while electronic bullying was reported at 6.27%. Name-calling was the most common form of traditional bullying, with text messages being the most prevalent form of cyberbullying. Moreover, 6.14% of respondents experienced both traditional and cyberbullying, and 20% were victims of both. Cyberbullying was considered more harmful, with 60% of respondents expressing sympathy and a desire to help victims.

Semerci (2016) [36] aimed to identify middle school students' views on bullying via text messages and online communication in Ankara, Turkey. The study found that victims informed their parents about cyberbullying incidents, and the frequency of internet usage was negatively associated with the occurrence of text message bullying. Most victims were afraid to respond to the messages they received.

Al-Rifai (2018) [43] examined the prevalence of bullying among middle school students in Kuwait from the perspectives of students, teachers, and social workers. The study revealed a 64.33% increase in bullying among intermediate school students, indicating a negative trend in the educational sector within an Arab Muslim society.

Bouderbala (2020) [15] conducted a field study examining the role of digital education in promoting responsible usage of new media from the perspective of teachers across different educational stages in Ouargla. The study employed a descriptive methodology and utilized interviews as the primary data collection tool. A sample of ten teachers representing various educational levels (i.e., primary, intermediate, and secondary) in Ouargla were interviewed. The study revealed a significant concern regarding the negative impact of students' improper and irrational utilization of new media, particularly among primary and intermediate students. However, it was observed that the participants had acquired fundamental skills for responsible use of new media. The study highlighted the immediate and imperative need to provide teachers with digital education training and support by organizing workshops before incorporating digital education into the educational curriculum. In conclusion, the study put forward several suggestions and recommendations.

Al-Hamdani (2020) [16] aimed to assess the attitudes of secondary school teachers towards education, investigate potential gender-based differences in attitudes, identify the key challenges and obstacles associated with e-learning in educational institutions, and propose strategies for addressing and overcoming these obstacles. To achieve these objectives, the researcher developed a 12-item scale and administered it to a randomly selected sample of male and female teachers from schools under the Salah al-Din Education Directorate. The results revealed a lackluster inclination toward digital education among the student population and demonstrated no statistically significant variations in attitudes toward digital education based on gender or disciplinary backgrounds.

Al-Zahrani (2022) [44] set out to explore the challenges of digital education and propose strategies for addressing them in the context of contemporary developments. The study employed a descriptive approach due to the nature of the research. Several conclusions were drawn, emphasizing the urgent and modern necessity of digital education. Addressing its challenges necessitates coordinated efforts between educational institutions, community organizations, and media outlets. The study underscored the importance of supporting effective digital education through the development of education policies, plans, teacher preparation, curriculum enhancement, and evaluation methods to enhance educational outcomes. Furthermore, digital education was found to contribute to cultivating a generation proficient in self-monitoring and responsible, ethical, and secure use of digital technologies and their diverse applications.

Commenting on Previous Studies

A literature review on cyberbullying and digital education reveals agreement on the existence of cyberbullying among students, with social networks and cell phones as primary tools. Some studies focus on the relationship between cyberbullying, gender, race, and identity, and the descriptive method is consistently utilized (Ratliffe & Mark, 2011; Frisén, Slonje, et al., 2012) [5] [6]. However, variations exist due to differences in cultural and geographical contexts, percentages of victims, and methods to measure and analyze cyberbullying.

Each study emphasizes specific aspects, such as age, gender [5] [6], the role of digital education [15], faculty attitudes [16], or collaborative efforts in addressing challenges [44].

The current study diverges in focusing on the Saudi Arabian context and examining the role of digital education in developing strategies for female secondary school students, assessing the impact of bullying, its methods of dissemination, and potential solutions. Insights from previous research were leveraged to define the research problem, select

methodology, establish objectives, and employ suitable statistical tools and methods that align with the study's goals.

8. Research Methodology

The research relied on the quantitative survey descriptive method, which is concerned with describing reality by collecting data from a specific sample or all society members through questionnaires or interviews in a specific community or sample.

8.1 Research community and sample

The research sample consisted of 390 secondary school female students in Riyadh, and the research sample was taken in a cluster random way from the total research community, as the number of secondary school female students in Riyadh reached 74647 according to the data of the Ministry of Education for the year 1442 AH (Ministry of Education, 1441 /1442 AH). As shown by the annual report of the Education Ministry, the results in 1442/1443 AH in the statistics that were conducted on male and female students in the Kingdom.

8.2 The research tool:

The questionnaire was chosen as a research tool to achieve its objectives and answer its questions, revealing the role of digital education in improving secondary school students' confrontation with cyberbullying in Riyadh. The researcher developed a special questionnaire as a tool for collecting data based on theoretical literature and previous studies, such as Hussein (ng secondary school students' confrontation with cyberbullying in Riyadh). The researcher developed a special questionnaire as a tool for collecting data based on theoretical literature and previous studies, such as Hussein (2016), Ratliffe & Mark (2011), Alwan (2016), Bouderbala (2020), and Al-Zahrani (2022) [33], [5], [8], [15], [44].

The questionnaire consisted of four dimensions: The first dimension, the reality of digital education for secondary school students, is comprised of 11 items. The second dimension is "forms of cyberbullying", which means how bullies harm others, which is five items. The third dimension is the effects of cyberbullying, and it means the outcomes that may occur due to the student being subjected to cyberbullying, which is ten items. The fourth dimension is "ways to activate the role of digital education to deal with cyberbullying, which means the methods that the student sees as effective in dealing with cyberbullying, which is 18 items. Thus, the questionnaire has 46 items. To respond to the questionnaire, a five-point Likert scale was relied upon, so that the responses are based on items of (5 degrees) completely agree, (4 degrees) agree, (3 degrees) somewhat disagree, (2 degrees) disagree, and (1 degree) absolutely disagree. Dimensions and indications of the five-point Likert scale:

Table 1: The degree of agreement with the arithmetic mean values

The agreement degree	the arithmetic mean
Completely agree	4.2 and above.
Agree	3.4 to less than 4.2
Somewhat	2.6 to less than 3.4
Disagree	1.8 to less than 2.6
Absolutely disagree	Less than 1.8

8.3 Validity of the questionnaire:

To ensure the apparent validity of the questionnaire, it was presented to some specialists in psychology, measurement, and evaluation, numbering (10) arbitrators, as some items were reformulated, merged, and deleted, either due to their repetition or inappropriateness, and the items that were unanimously agreed upon (80%) and more of the arbitrators were kept, as (9) items were deleted in which the condition of the agreement was not met, and these procedures were considered evidence of the apparent validity of the tool.

8.4 The stability of the questionnaire

The stability of the questionnaire was calculated using the split-half method and the error correction coefficient using the Spearman correlation equation. The stability coefficient was also calculated using the internal consistency method using the Cronbach alpha equation. These values were considered appropriate for the research objectives.

The study will assess the stability of the questionnaire through two methods: Spearman's rank correlation coefficient and Cronbach's alpha stability coefficient.

Spearman's rank correlation coefficient is utilized to measure the degree of correlation between two sets of ranked variables, with values ranging from -1 to 1. A value of 1 indicates a perfect positive correlation, while -1 indicates a perfect negative correlation. Spearman's equation is used to determine the stability of the questionnaire when measuring

The formula for Spearman's rank correlation coefficient (ρ) is as follows: $\rho = 1 - (6 * \Sigma d^2) / (n * (n^2 - 1))$

Where: ρ : Spearman's rank correlation coefficient Σd^2 : sum of the squared differences between the order of the primary and secondary variables n : number of variables (or items) compared

By calculating the differences between the order of the primary and secondary variables, squaring each difference, and summing them, the Spearman correlation coefficient can be determined. A high and positive coefficient (close to 1) indicates a strong correlation and stability.

Cronbach's alpha stability coefficient is another measure used to evaluate the stability of questionnaires and tests. This coefficient assesses the internal consistency of the questions within a questionnaire or test when measuring the same trait or concept. Cronbach's alpha stability coefficient ranges from 0 to 1, with higher values (usually 0.7 or higher) indicating better stability of the instrument.

To calculate Cronbach's alpha stability coefficient, the variance of responses for each question is calculated and summed. The variance of the total responses to the questions or items is then determined. Finally, the aforementioned equation is used to calculate Cronbach's alpha, with a high and positive coefficient (usually 0.7 or higher) indicating good stability of the questionnaire or test.

Table 2: the coefficient of stability of the resolution using Cronbach's alpha Coefficient & Spearman's rank correlation coefficient.

N	Dimension	Spearman's rank correlation coefficient	Cronbach's alpha Coefficient
1	The reality of digital education for secondary school students	0.965	0.982
2	Forms of cyberbullying	0.878	0.911
3	Effects of cyberbullying	0.886	0.937
4	Ways to activate the role of digital education to deal with cyberbullying	0.809	0.919
5	Average	0.884	0.937

Z = 0.982 at the level 0.01

Z = 0.809 at the level 0.01

The statistical analysis results, as presented in Table 2, indicate the reality of digital education among female secondary school students in Riyadh. The stability coefficient (Cronbach's alpha) yielded a value of approximately 0.98, while the Spearman correlation coefficient attained a value of 0.97. These values represent a relatively high level of stability for both Cronbach's alpha and Spearman's coefficient.

Regarding the second dimension, which explores the forms of electronic bullying, it obtained a lower rank in terms of stability coefficients. The Cronbach's alpha stability coefficient for this dimension was 0.911, while the Spearman's coefficient was 0.809. In the third dimension, which examines the effects of electronic bullying, the stability coefficient (Cronbach's alpha) reached a value of 0.94, with a Spearman correlation coefficient of 0.89. For the fourth dimension, focusing on ways to activate the role of digital education in dealing with cyberbullying, the Cronbach's alpha stability coefficient was 0.92, while the Spearman coefficient was 0.81. Across all dimensions of the questionnaire, the overall Cronbach's alpha was calculated to be 0.94, and the Spearman coefficient was 0.88. The statistical significance for each coefficient was established at a significance level of 1%. These high stability coefficients indicate that the questionnaire is highly stable and suitable for research purposes, despite variations in the calculation methods across dimensions (Table 2).

8.5 Sources for Developing the Research Tool

In developing the primary research tool, the questionnaire, the following sources were utilized:

- Review of Previous Studies: A comprehensive examination of the existing literature on the research topic was conducted to gain new insights and ideas regarding questions that could enhance understanding of the role of digital education in enhancing the ability of female secondary school students to navigate the risks associated with cyberbullying.
- Scientific Journals: Relevant scientific studies and research published in reputable journals that specifically addressed the dangers of cyberbullying and the role of digital education in empowering female secondary school students to effectively combat bullying were reviewed. This process aimed to acquire novel and innovative ideas and concepts that could contribute to the development of the questionnaire.

- **Identification of Key Dimensions:** The primary dimensions related to the phenomenon of cyberbullying were identified based on a comprehensive review of the literature. This step allowed for the inclusion of crucial aspects that would facilitate a comprehensive examination of the research topic.
- **Consultation with Education Experts:** Experts in the field of education and educational technology, particularly from faculties of education and related disciplines, were consulted. Their expertise and insights were sought to ensure the questionnaire adequately covered the relevant aspects of digital education and its impact on female secondary school students' ability to confront cyberbullying.

* **Engagement with Relevant Stakeholders:** Authorities, families, schools, and teachers who are directly involved in addressing cyberbullying were contacted and engaged in direct conversations. These interactions were vital in obtaining firsthand information about the role of digital education in empowering female secondary school students to effectively address the dangers of cyberbullying.

8.6 Research Limitations:

- **Objective Determinants:** The research focused on examining the role of digital education in enhancing the ability of female secondary school students in Riyadh to confront cyberbullying from their own perspective.
- **Human Determinants:** The research was conducted among a sample of 390 female secondary school students.
- **Spatial Determinants:** The research took place in secondary schools for girls located in Riyadh.
- **Temporal Determinants:** The research was conducted during the second semester of the academic year 1444 AH.

9. Results

9.1 Results related to the First Dimension: The Reality of Digital Education among Secondary School Female Students in Riyadh, Saudi Arabia:

The statistical analysis of items reflecting the reality of digital education among secondary school female students is presented in Table 3. The findings reveal that the mean scores for this dimension ranged from 2.75 to 2.83. Notably, item 3, which emphasizes the importance of the school's educational values in respecting the privacy and well-being of others, and item 10, which indicates the school's efforts to warn students against spying and violating others' privacy, obtained the highest rankings with an average score of approximately 2.83 each. Conversely, item 7, which pertains to the school's assertion of intellectual property rights, obtained the lowest ranking with an average score of 2.75. Overall, the dimension garnered an average score of approximately 2.80, indicating a moderate level of agreement among respondents regarding the reality of digital education in this specific aspect.

Table 3: The Reality of Digital Education among Secondary School Students in Confronting Cyberbullying Phenomenon

No.	Items	Frequency										Arithmetic mean	standard deviation	coefficient of error
		1		2		3		4		5				
		F	%	F	%	F	%	F	%	F	%			
1	The school offers seminars, lectures, and workshops that explain the pros and cons of modern technologies.	29	7.5	118	30.3	148	38	84	21.6	10	2.6	2.81	.943	.048
2	The school guides the students on how to make the best use of modern technologies.	31	8	113	29	152	39.1	84	21.6	9	2.3	2.81	.941	.048
3	The school's educational values emphasize the importance of respecting the private lives of others and not harming them.	28	7.2	116	29.8	156	40.1	71	18.3	18	4.6	2.83	.963	.049
4	The school promotes the student's responsibility for her behavior while dealing with technology..	32	8.2	114	29.3	151	38.8	80	20.6	12	3.1	2.81	.958	.049

5	The school demonstrates to the students the limits of their ability to deal with modern technologies.	36	9.3	114	29.3	147	37.8	79	20.3	13	3.3	2.79	.979	.050
6	The school teaches students about the importance of validating the information available on the Internet.	35	9	111	28.5	158	40.6	69	17.7	16	4.1	2.79	.973	.049
7	The school asserts intellectual property rights.	37	9.5	120	30.8	148	38	71	18.3	13	3.3	2.75	.972	.049
8	The school administration and teachers stress the importance of respecting laws, especially those related to official educational platforms.	37	9.5	114	29.3	144	37	79	20.3	15	3.9	2.80	.996	.051
9	The school carries out its educational role by dealing optimally with modern technology by using various communication tools such as radio, theatre, and mobile phones.	35	9	111	28.5	152	39.1	78	20.1	13	3.3	2.80	.971	.049
10	The school warns the students against spying and violating the privacy of others.	34	8.7	110	28.3	151	38.8	76	19.5	18	4.6	2.83	.993	.050
11	The school explains the penalties for information crimes.	33	8.5	113	29	150	38.6	79	20.3	14	3.6	2.81	.972	.049
	Total	33.4	8.6	114.	29.3	150.	38.7	77.3	19.9	13.7	3.5	2.8	1.0	0.05

9.2. Results of the Study Related to the Second Dimension: Forms of Cyberbullying:

The analysis of data presented in Table 4 examines the various forms of cyberbullying. The statistical analysis reveals that the mean scores for this dimension ranged from 4.03 to 4.24. Among the different forms, item 14, which addresses the act of using derogatory language to diminish the efforts and participation of others in online communication, received the highest mean score of 4.24. On the other hand, item 12, which pertains to sending threatening statements during instant chats or virtual classes, obtained the lowest mean score of 4.03. The overall mean score for this dimension was calculated to be 4.15, indicating a significant level of agreement among the respondents regarding the forms of cyberbullying being examined.

Table 4: Statistical Analysis Results of Respondents' Responses on the Dimension of Cyberbullying Forms in Electronic Websites and Applications from the Perspective of Female Secondary School Students in Riyadh, Saudi Arabia.

No.	Items	Frequency										Arithmetic mean	standard deviation	coefficient of error
		1		2		3		4		5				
		F	%	F	%	F	%	F	%	F	%			
12	Sending threatening statements during instant chats or virtual classes.	14	3.6	12	3.1	44	11.3	196	50.4	123	31.6	4.03	.937	.048
13	Sending racist and hateful insults during instant chats or virtual classes.	14	3.6	6	1.5	33	8.5	194	49.9	142	36.5	4.14	.904	.046
14	Pronunciation of words that detract from the efforts and participation of others in the praise of electronic communication.	12	3.1	11	2.8	17	4.4	180	46.3	169	43.4	4.24	.901	.046
15	Pronunciation of words that detract from the property of others, such as housing, clothing, school supplies, and others.	16	4.1	5	1.3	28	7.2	188	48.3	152	39.1	4.17	.926	.047

16	Spreading rumors and false news through various electronic means of communication.	15	3.9	15	3.9	30	7.7	152	39.1	177	45.5	4.19	1.001	.051
	Total	14.2	3.66	9.8	2.52	30.4	7.82	182	46.8	152.6	39.22	4.2	0.934	0.046

9.3. Results of the Study Related to the Second Dimension: Forms of Cyberbullying

The analysis of the data presented in Table 5 examines the various forms of cyberbullying. The statistical analysis reveals that the mean scores for this dimension ranged from 4.03 to 4.24. Among the different forms, item 14, which addresses the act of using derogatory language to diminish the efforts and participation of others in online communication, received the highest mean score of 4.24. On the other hand, item 12, which pertains to sending threatening statements during instant chats or virtual classes, obtained the lowest mean score of 4.03. The overall mean score for this dimension was calculated to be 4.15, indicating a significant level of agreement among the respondents regarding the forms of cyberbullying being examined.

Table 5: Statistical Analysis Results: Cyberbullying Forms in Electronic Websites and Applications from Female Secondary School Students' Perspective in Riyadh, Saudi Arabia.

No.	Items	Frequency										Arithmetic mean	standard deviation	coefficient of error
		1		2		3		4		5				
		F	%	F	%	F	%	F	%	F	%			
12	Sending threatening statements during instant chats or virtual classes.	14	3.6	12	3.1	44	11.3	196	50.4	123	31.6	4.03	.937	.048
13	Sending racist and hateful insults during instant chats or virtual classes.	14	3.6	6	1.5	33	8.5	194	49.9	142	36.5	4.14	.904	.046
14	Pronunciation of words that detract from the efforts and participation of others in the praise of electronic communication.	12	3.1	11	2.8	17	4.4	180	46.3	169	43.4	4.24	.901	.046
15	Pronunciation of words that detract from the property of others, such as housing, clothing, school supplies, and others.	16	4.1	5	1.3	28	7.2	188	48.3	152	39.1	4.17	.926	.047
16	Spreading rumors and false news through various electronic means of communication.	15	3.9	15	3.9	30	7.7	152	39.1	177	45.5	4.19	1.001	.051
	Total	14.2	3.66	9.8	2.52	30.4	7.82	182	46.8	152.6	39.22	4.2	0.934	0.046

9.4 Results of the Study Related to the Third Dimension: Effects of Cyberbullying:

The statistical analysis results presented in Table 6 provide insights into the effects of cyberbullying. The mean scores for the items in this dimension ranged from 3.99 to 4.34. Item 17, which pertains to the act of attempting self-harm, and item 18, which relates to an increased level of social anxiety, obtained the highest rankings with an average score of 4.34. Conversely, item 24, which addresses the desire to leave school, obtained the lowest ranking with an average score of approximately 3.99. The overall mean score for this dimension was calculated to be 4.15, indicating a significant degree of agreement among the items within this dimension regarding the negative effects and consequences associated with cyberbullying.

Table 6: Statistical Analysis Findings on Detrimental Effects of Cyberbullying as Perceived by Female Secondary School Students in Riyadh, Saudi Arabia.

No.	Items	Frequency	A	r	s	c	o
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		1		2		3		4		5				
		F	%	F	%	F	%	F	%	F	%			
17	Attempting to harm oneself	7	1.8	4	1	16	4.1	184	47.3	178	45.8	4.34	.766	.039
18	Increased level of social anxiety.	8	2.1	0	0	19	4.9	187	48.1	175	45	4.34	.755	.038
19	The student's tendencies to social isolation.	6	1.5	4	1	22	5.7	180	46.3	177	45.5	4.33	.764	.039
20	Low level of self-esteem.	9	2.3	4	1	44	11.3	192	49.4	140	36	4.16	.836	.042
21	Cyberphobia (extreme fear or dislike of computers).	8	2.1	8	2.1	58	14.9	179	46	136	35	4.10	.871	.044
22	Low academic level.	5	1.3	6	1.5	55	14.1	192	49.4	131	33.7	4.13	.801	.041
23	Frequent absences from virtual classes.	5	1.3	6	1.5	57	14.7	190	48.8	131	33.7	4.12	.805	.041
24	Desire to leave school.	8	2.1	8	2.1	69	17.7	199	51.2	105	27	3.99	.846	.043
25	Acquiring bullying behavior in the future.	10	2.6	6	1.5	55	14.1	212	54.5	106	27.2	4.02	.842	.043
26	Suffering from sleep disorders.	8	2.1	5	1.3	44	11.3	209	53.7	123	31.6	4.12	.809	.041
27	Suffering from physical pains such as headaches and stomachaches.	8	2.1	11	2.8	42	10.8	190	48.8	138	35.5	4.13	.864	.044
	Total	7.45	1.94	5.64	1.44	43.73	11.24	192.18	49.41	140	36	4.16	0.81	0.04

9.5 Results Related to the Fourth Dimension: Effective Mechanisms to Address Cyberbullying from the Perspective of the Students:

The statistical analysis results presented in Table 7 illustrate the responses of the research participants regarding the activation of appropriate mechanisms to combat cyberbullying. The mean scores for this dimension ranged from 4.29 to 4.49. Item 46, which emphasizes the importance of educating and raising awareness among students about the advantages and disadvantages of technology, received the highest mean score of 4.49. Conversely, item 33, which pertains to elevating the academic level of bullying students to align with their peers, obtained the lowest mean score of 4.29. The overall mean score for this dimension was calculated to be 4.37. This value, based on the significance of the mean scores on the five-point Likert scale, suggests a strong level of agreement and support among the research participants regarding the vital role played by digital education in addressing the issue of cyberbullying.

Table 7: Statistical Analysis Results on Activation of Digital Education Mechanisms to Address Cyberbullying, from Respondents' Perspectives

No.	Items	Frequency										Arithmetic standard deviation coefficient		
		1		2		3		4		5				
		F	%	F	%	F	%	F	%	F	%			

28	Activating the role of parental upbringing.	1	0.3	1	0.3	14	3.6	215	55.3	158	40.6	4.36	.591	.030
29	Educating the family about cyberbullying and ways to prevent it.	0	0	1	0.3	14	3.6	210	54	164	42.2	4.38	.569	.029
30	Family discussion of the student on how to report cyberbullying.	0	0	0	0	10	2.6	223	57.3	156	40.1	4.38	.535	.027
31	Solving family problems such as divorce and the absence of the active role of the father and mother inside the home.	1	0.3	1	0.3	10	2.6	226	58.1	151	38.8	4.35	.571	.029
32	Create an environment around the student.	0	0	1	0.3	11	2.8	224	57.6	153	39.3	4.36	.551	.028
33	Raising the academic level of the bullying students to match the rest of the students.	4	1	4	1	22	5.7	203	52.2	156	40.1	4.29	.712	.036
34	Attention to the student's personality, abilities, and tendencies by the school community.	1	0.3	0	0	8	2.1	230	59.1	150	38.6	4.36	.550	.028
35	Do not open the camera during the virtual lesson unless necessary.	2	0.5	1	0.3	9	2.3	219	56.3	158	40.6	4.36	.596	.030
36	Not allowing all students to open the audio receiver at the same time in the virtual lessons.	2	0.5	1	0.3	20	5.1	214	55	152	39.1	4.32	.631	.032
37	Not to share with others the data related to accessing the e-learning platforms.	0	0	1	0.3	15	3.9	219	56.3	154	39.6	4.35	.567	.029
38	Educating students about ways to prevent cyberbullying.	0	0	0	0	11	2.8	219	56.3	159	40.9	4.38	.541	.027
39	Raise the students' awareness of the consequences of cyberbullying.	1	0.3	1	0.3	13	3.3	210	54	16	42	4.38	.500	.020
40	Not giving students the freedom to display their possessions when participating by opening the camera.	3	0.8	3	0.8	12	3.1	204	52.4	167	42.9	4.36	.657	.033
41	Set internet usage time.	1	0.3	0	0	8	2.1	221	56.8	159	40.9	4.34	.617	.031
42	Enhancing students' skills for electronic prevention, such as deleting, blocking, and reporting bullying phrases.	1	0.3	2	0.5	18	4.6	210	54	158	40.6	4.38	.555	.028
43	Addressing the bully's previous exposure to bullying.	0	0	3	0.8	12	3.1	211	54.2	163	41.9	4.37	.585	.030
44	The student does not share her photos.	2	0.5	0	0	10	2.6	208	53.5	169	43.4	4.39	.594	.030
45	Keeping personal secrets and not sharing them freely with others.	1	0.3	1	0.3	4	1	201	51.7	182	46.8	4.44	.561	.028
46	Immunizing and educating the student about the advantages and disadvantages of technology.	2	0.5	0	0	4	1	183	47	200	51.4	4.49	.577	.029

Total	1.16	0.31	1.11	0.31	11.84	3.05	213.16	54.79	161.74	41.58	4.37	0.59	0.03
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10. Discussion

10.1. Regarding the findings pertaining to the first dimension, "the reality of digital education among secondary school female students in Riyadh, ”: the results presented in Table 3 demonstrate that the overall mean values for this dimension ranged from 2.75 to 2.83, indicating a moderate level of agreement ranging from 2.6 to 3.4. These findings indicate that most of the research participants recognize the existence and importance of digital education among female secondary school students. The results underscore the significant role of digital education in students' lives, as it safeguards their human rights and protects them from cyberbullying. By fostering a culture of safety and equipping students with digital literacy skills, digital education safeguards them from exploitation, extortion, and cybercrimes, aligning with one of the primary objectives of digital education. These study results are consistent with those of Bouderbala (2020) [15], who similarly found that digital education influences conscious behavior by aiding students in overcoming illiteracy using new media and equipping them with essential skills that promote responsible usage. Additionally, the results underline the urgent need to support teachers in acquiring digital education competencies, as highlighted in Al-Hamdani's (2020) [16] research, which emphasizes the significance of digital education as a contemporary necessity requiring continuous development and the resolution of associated challenges. These findings are also aligned with Al-Zahrani's (2022) [44] study, which asserts that digital education plays a crucial role in enhancing the generation's awareness of self-censorship and fostering informed, responsible, ethical, and safe utilization of digital technologies, applications, and various platforms.

10.2. Moving on to the results obtained from the second dimension, which focuses on identifying forms of cyberbullying on electronic websites and applications from the perspective of female secondary school students in Riyadh, Saudi Arabia: Table 4 illustrates that the arithmetic mean values for the expressions within this domain range from 4.03 to 4.24, falling into the category of complete agreement. These findings indicate a high percentage of female students who concur with these opinions, suggesting that the forms examined in this dimension accurately reflect the real manifestations and patterns of cyberbullying. The means of cyberbullying, including smartphones, computers, laptops, and tablets, align with Ratliffe and Mark's (2011) [5] research, which identified the prevalent methods employed in cyberbullying (Slonje, et al., 2012) [6]. The results confirm that students are exposed to and engage in cyberbullying through diverse means and forms, such as computers, smart mobile devices, text messages, email, phone calls, photo and video sharing, and chat rooms. This corroborates the findings of Rice et al., (2015) [7] which revealed that cyberbullying frequently occurs on Facebook or via text messages. Similarly, Alwan's (2016) [8] results indicated that 6.32% of respondents perceived traditional bullying as transpiring in schools at a rate of 1.39%, while electronic bullying occurred at a rate of 6.27%. Notably, text messages emerged as the most common medium for cyberbullying, with 6.14% of respondents admitting to being both traditional and electronic bullies through text messages.

10.3 The results pertaining to the third dimension, which focuses on the effects of cyberbullying, are presented in Table 5. The statistical analysis reveals that the arithmetic mean for this dimension ranges from 3.99 to 4.34, indicating a high level of agreement. These findings underscore the significance of examining the consequences of cyberbullying, which extend beyond the victims and impact the bullies themselves. Existing literature supports the notion that bullies are at risk, as engaging in cyberbullying contributes to an increase in psychosocial and behavioral problems, making them susceptible to aggressive behaviors. Cyberbullying is associated with heightened levels of aggression, rule-breaking, delinquency, noncompliance with social norms, academic difficulties, an elevated risk of depression and substance abuse, weak emotional bonds with parents, and low self-esteem (Sourander et al., 2010) [18]. These findings are consistent with previous research by Schenk and William (2012) [45], who identified depression, anxiety, and phobias as prominent psychological effects of cyberbullying, and Moreno et al. (2013) [46] and Perry (2015) [47], who found that school students who experience cyberbullying exhibit signs of decreased self-confidence, withdrawal from social interactions, and strained relationships with friends and family. Furthermore, Hellfeldt, et al., (2019) [48] affirmed that cyberbullying is strongly associated with higher levels of depressive symptoms and lower levels of family support.

10.4 The fourth dimension explores the mechanisms for activating the role of digital education in addressing cyberbullying: as depicted in Table 6. The arithmetic mean values for this dimension range from 4.29 to 4.49, falling into the category of complete agreement. This dimension stands out with exceptionally high average ratings due to its significant importance and substantial role. The literature highlights the perils of cyberbullying and emphasizes that equipping adolescents with problem-solving skills enables them to navigate the digital world more independently (Perry, 2015; Hinduja & Patchin, 2013; Choucalas, 2013) [47], [49], [50]. These findings align with

Bouderbala's (2020) [15] research, which underscores the urgent and essential need to support teachers with digital education skills and provide training through workshops before incorporating digital education into the educational curriculum. Al-Zahrani (2022) [44] also emphasizes the importance of digital education and its active role in educational development, policies, plans, teacher advancement, curriculum design, and assessment methods, ultimately contributing to the overall educational process. Digital education proves reliable and plays a vital role in enhancing the younger generation's awareness of self-monitoring, promoting conscientious and optimal use of social media, and ensuring safe and ethical utilization of digital technologies and their diverse applications.

11. Conclusion

The key findings of this study are as follows:

1. The fourth dimension, concerning mechanisms for activating the role of digital education in addressing cyberbullying, demonstrated consistently high agreement, with arithmetic mean values ranging from 4.29 to 4.49. This dimension holds significant importance and plays a pivotal role, as evidenced by the unanimous agreement among all participants.
2. The third dimension, which focuses on the effects of cyberbullying, obtained arithmetic mean values ranging from 3.99 to 4.34, placing it in the category of agreement and ranking second after the fourth dimension.
3. The second dimension, examining the identification of cyberbullying forms on electronic platforms from the perspective of female secondary school students, ranked third. The arithmetic mean values for this dimension fell between 4.03 and 4.24, indicating a high percentage of agreement among female students regarding these opinions.
4. Lastly, the first dimension, exploring the reality of digital education among female secondary school students, received neutral average ratings ranging from 2.75 to 2.83, categorizing it as somewhat agreeable. These findings suggest that the majority of the research sample recognizes the importance and role of digital education in our lives.
5. This logical arrangement highlights the significance of digital education and emphasizes the crucial roles of educators as well as those responsible for monitoring and guiding students, such as families and schools. It underscores the importance of providing guidance and support to students, helping them overcome the challenges posed by cyberbullying.

12. Recommendations

1. Increase Awareness and Adopt Modern Strategies: Enhance awareness among female students about cyberbullying and implement contemporary strategies to effectively address this issue.
2. Develop Digital Awareness Programs: Create comprehensive programs that emphasize digital awareness and safe internet usage skills to educate students about responsible online behavior, privacy protection, and potential risks.
3. Encourage Reporting and Support Channels: Establish effective reporting and follow-up channels for students to report cyberbullying incidents and provide them with necessary assistance and guidance in a supportive environment.
4. Promote Collaboration: Foster collaboration between schools, parents, and stakeholders to address cyberbullying effectively, engaging parents in tackling the issue and ensuring a safe educational environment.
5. Provide Training and Workshops: Organize specialized training programs and workshops for teachers and counsellors to address cyberbullying cases, support affected students, and create a positive and inclusive school environment.

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Conflicts of Interest Statement

I declare the author has no competing interests or other interests that might be perceived to influence the interpretation of the article.

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