FROM DIGITAL INTERACTION TO EMOTIONAL AWARENESS: ARTIFICIAL INTELLIGENCE, NON-COGNITIVE SKILLS AND CYBERBULLYING

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ABSTRACT
In digitally mediated educational contexts, bullying and cyberbullying reflect a crisis in socio-emotional competencies, amplified by online interactions. This contribution explores the role of emerging technologies, artificial intelligence, social robotics, and emotionally aware environments, as pedagogical tools for prevention. Through a comparative observational study conducted across six school contexts located in different European countries, based on questionnaires and interviews with teachers and students, the research analyzes educational practices and levels of digital affective literacy. The findings highlight how the integration of non-cognitive skills with the critical use of AI can foster empathy, awareness, and well-being, while also raising ethical concerns related to the simulation of emotions. The study emphasizes the central role of teacher training in managing relational dynamics within technologically mediated contexts.

KEYWORDS
Cyberbullying; digital affective literacy; artificial intelligence.

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1. Introduction

In recent years, the widespread diffusion of digital technologies has profoundly transformed educational contexts, reshaping the ways in which students communicate, learn, and build social relationships (Naeem, & Mushibwe, 2025). Digital platforms, social networks, instant messaging applications, and virtual environments now represent central spaces of adolescent socialization, significantly influencing processes of identity construction, social belonging, and school participation (Timotheou et al., 2023). Although these tools provide important opportunities for access to knowledge, collaboration, and inclusion, they have also contributed to the emergence of new forms of relational vulnerability and peer conflict (Kalmus et al., 2024). Within this evolving scenario, bullying and cyberbullying represent some of the most critical contemporary educational challenges, negatively affecting psychological well-being, academic achievement, and the overall quality of school life (Obaidat et al., 2023).

Cyberbullying differs from traditional bullying because of specific characteristics related to technological mediation . Online communication enables the rapid and potentially unlimited dissemination of offensive, humiliating, or discriminatory content, amplifying the emotional impact of aggression. Unlike traditional bullying, which mainly develops within physically bounded environments, cyberbullying transcends the temporal and spatial boundaries of school, accompanying victims into domestic and private spaces (Lim et al., 2023). Offensive messages, digital social exclusion, unauthorized image sharing, derogatory comments, and repeated harassment may persist over time, generating anxiety, isolation, insecurity, and emotional distress. Several European studies have shown that victims of cyberbullying experience higher levels of psychological stress, depressive symptoms, lower self-esteem, and relational difficulties, with consequences that may compromise learning processes and school participation (Casaña et al., 2026; Luo et al., 2023; Ramadan et al., 2024).

The growing spread of these phenomena has encouraged educational research to investigate not only the behavioral dynamics of online aggression, but also the socio emotional competencies necessary to promote healthy and inclusive relationships in digital environments (Marín-López, & Zych, 2023). In many cases, bullying and cyberbullying reflect a broader crisis in relational and affective competencies. Difficulties in recognizing one's own emotions and those of others, limited empathy, communicative impulsivity, and poor conflict management are frequently associated with aggressive online behaviors. Screen mediated communication also tends to reduce the immediate perception of the emotional consequences of one's actions,

weakening processes of individual responsibility. The absence of non-verbal cues, such as facial expressions, tone of voice, and body language, makes it more difficult to interpret the emotional experiences of others and may facilitate moral disengagement and the normalization of aggression (Cebollero-Salinas et al., 2025).

Within this framework, non-cognitive skills assume a central role in contemporary educational processes. Empathy, emotional self-regulation, resilience, cooperation, social awareness, and communication skills are now considered fundamental dimensions for the construction of individual and collective well-being (Solas-Martínez et al., 2025). European educational policies have progressively emphasized the importance of integrating socio emotional education into school curricula, recognizing that cognitive development cannot be separated from students' relational and emotional growth. Preventing bullying therefore requires educational approaches aimed at promoting inclusion, critical digital citizenship, and ethical responsibility in online interactions (Salem et al., 2023).

At the same time, the introduction of artificial intelligence and emerging technologies into educational contexts is redefining the relationship between education, learning, and social interaction. Artificial intelligence systems are increasingly used in adaptive learning environments, personalized educational platforms, educational chatbots, and systems designed to monitor student engagement (Jafari, 2024). In particular, emotionally aware technologies, namely systems capable of recognizing, interpreting, or simulating emotions through the analysis of behavioral data, facial expressions, verbal language, or vocal parameters, are attracting growing attention. Alongside these tools, educational social robotics proposes social robots specifically designed to interact with students during learning, emotional support, and collaborative activities (Sharma, & Kumar, 2023).

From a pedagogical perspective, these technologies may represent innovative tools for prevention of bullying and the promotion of socio emotional competencies. Educational environments supported by artificial intelligence may foster experiential learning pathways focused on emotional recognition, conflict management, and empathy development (Attique et al., 2026). Through simulations, adaptive feedback, and interactive scenarios, students can engage in reflective activities that promote relational awareness and perspective taking abilities. Similarly, social robots may facilitate the participation of vulnerable students or learners with communicative difficulties, contributing to the construction of inclusive and collaborative environments.

However, the educational use of artificial intelligence also raises important ethical and pedagogical concerns. One of the main critical issues concerns the

simulation of emotions by artificial technologies. Although chatbots, social robots, and emotionally responsive systems may appear empathic or emotionally engaging, they do not possess genuine emotional experience, but operate through algorithmic processes of recognition and response (Yuskovych-Zhukovska et al., 2022). This opens significant questions regarding the authenticity of relationships, the possibility of emotional dependency on artificial systems, and the risk of progressively replacing direct human interactions with technologically mediated forms of communication. Within educational contexts, these concerns are particularly delicate because students' socio emotional development fundamentally depends on the quality of meaningful human relationships (Galindo-Domínguez et al., 2024).

Another critical issue concerns the management of personal and emotional data collected by intelligent systems. Emotion recognition technologies often rely on the analysis of sensitive data related to facial expressions, voice tone, behaviors, or communicative patterns. The use of such information therefore requires careful reflection on privacy, child protection, informed consent, and algorithmic transparency (Vistorte et al., 2024). Furthermore, several studies have highlighted how artificial intelligence systems may reproduce cultural biases and stereotypes embedded within training data, generating potential forms of discrimination or distorted interpretations of students' emotions and behaviors.

Within this complex scenario, the role of teachers becomes increasingly strategic. Teachers are not only expected to transmit disciplinary knowledge, but also to promote relational competencies, critical digital education, and emotional well-being (Fernández Herrero et al., 2023). Managing social dynamics in technologically mediated environments requires new professional competencies related to media education, digital emotional literacy, and the critical understanding of emerging technologies. Nevertheless, many studies show that teachers still perceive themselves as insufficiently prepared to address cyberbullying episodes and online relational conflicts. The rapid pace of technological innovation often exceeds the rhythms of traditional teacher education, generating uncertainty regarding educational intervention strategies and the ethical management of digital tools (Lai et al., 2024).

In this sense, the concept of digital affective literacy becomes particularly relevant. This concept refers to the ability to recognize, interpret, and manage emotions within digital interactions. Such competence implies not only emotional awareness, but also critical understanding of communicative mechanisms, algorithms, and forms of technological mediation that shape online relationships (Fonseca, & Borges-Tiago, 2023). Promoting digital affective literacy means educating both students and teachers to use

technologies in responsible, empathic, and reflective ways, avoiding both relational disengagement and technocratic approaches that consider artificial intelligence as a neutral solution to educational problems.

Despite the growing scientific interest in the relationship between emerging technologies, socio emotional education, and cyberbullying prevention, the literature still presents several fragmented areas. Many studies focus exclusively on the psychological aspects of cyberbullying (Bansal et al., 2024; Darawsheh, 2023; Matsiuk, & Maslianikova, 2023) or on the technical effects of digital platforms (Malik, & Dadure, 2024; Nee et al., 2023; Obaidat et al., 2023), neglecting an integrated pedagogical perspective capable of connecting non cognitive skills, artificial intelligence, and educational practices. Furthermore, comparative studies across six school contexts located in different European countries examining the role of emotionally aware technologies in promoting relational well-being and preventing online aggressive dynamics remain limited. The issue of teacher training related to the critical and ethical use of artificial intelligence in educational processes also appears underexplored, particularly regarding the management of socio emotional dynamics mediated by technology.

Starting from these theoretical and practical gaps, the present contribution aims to offer an interdisciplinary reflection on the relationship between artificial intelligence, socio emotional competencies, and bullying prevention within digitally mediated educational contexts. Through a comparative observational study conducted across six school contexts located in different European countries, the research analyzes educational practices, teachers' and students' perceptions, and levels of digital affective literacy, with particular attention to the role of emerging technologies in the construction of inclusive and relationally sustainable school environments.

More specifically, the study aims to analyze the relationship between non cognitive skills and bullying and cyberbullying phenomena within digitalized school contexts, explore the pedagogical potential of artificial intelligence and emotionally aware technologies in promoting empathy and relational well-being, investigate teachers' and students' perceptions regarding ethical risks connected to emotional simulation by artificial systems, compare educational practices and levels of digital preparedness across the school contexts involved in the research, and highlight the strategic role of teacher training in managing online relational dynamics and promoting critical and inclusive digital citizenship.

1. METHOD

2.1 Study Design

The present study adopted a comparative cross sectional observational design aimed at analyzing the relationship between bullying, cyberbullying, socio emotional competencies, digital affective literacy, and the pedagogical use of emerging technologies within digitally mediated school contexts. The research was conducted across six school contexts located in different European countries in order to compare educational practices, levels of technological integration, and teachers' and students' perceptions regarding online relational dynamics and the educational potential of artificial intelligence.

The study employed a mixed methods approach integrating quantitative and qualitative data. Quantitative data were collected through standardized questionnaires administered to students and teachers, while qualitative data were obtained through semi structured interviews aimed at exploring experiences, perceptions, and educational practices related to bullying and cyberbullying prevention in digital contexts.

Schools were selected through purposive non probabilistic sampling based on institutional networks and European academic collaborations. Six upper secondary schools from six European countries, Italy, Spain, France, Germany, Greece, and the United Kingdom, participated in the study, with one school recruited from each country. Schools were selected according to their willingness to participate, the presence of educational environments characterized by significant use of digital technologies, and their availability to collaborate in the data collection procedures. This methodological choice aimed to ensure the inclusion of school contexts differing in levels of digitalization, pedagogical approaches, and cyberbullying prevention strategies. Accordingly, country labels were used to identify the geographical location of the participating schools and should not be interpreted as representative of the corresponding national educational systems.

2.2 Participants

The final sample consisted of 684 participants recruited from the six schools involved in the study. Specifically, the research included 592 students and 92 teachers. The student sample included adolescents aged between 14 and 18 years, with a mean age of 16.1 years, SD = 1.2. Of the total sample, 308 were female and 284 were male. Students attended different types of upper

secondary schools, including academic high schools, technical institutes, and vocational schools.

Students were recruited through the collaboration of school coordinators and voluntary participation within the participating institutions. Inclusion criteria included regular school attendance, habitual use of digital technologies and online platforms, and signed informed consent from parents or legal guardians for minor participants. Incomplete questionnaires or questionnaires characterized by inconsistent response patterns were excluded from the analyses.

The teacher sample consisted of 92 educators, including 61 females and 31 males, with a mean teaching experience of 14.3 years, SD = 6.7. Teachers belonged to different disciplinary areas, including humanities, sciences, technology, and physical education. Inclusion criteria included active teaching service within one of the participating schools and direct involvement in educational and relational school activities.

For the qualitative component of the study, a purposive subsample of 24 students and 12 teachers was identified to ensure diversity with respect to gender, age, teaching experience, and representation of the different national contexts involved in the research.

2.3 Procedures

Data collection was conducted between October 2025 and February 2026. During a preliminary phase, school principals of the selected institutions received detailed information regarding the aims of the study, methodological procedures, data management processes, and ethical safeguards.

Subsequently, informational meetings were organized with teachers, students, and families to explain the aims and procedures of the research. All participants were informed about the voluntary nature of participation, the anonymity of responses, and the possibility of withdrawing from the study at any stage without consequences.

For minor students, written informed consent was obtained from parents or legal guardians in addition to students' assent. Teachers independently provided informed consent.

Questionnaires were administered during school hours in supervised environments by trained researchers or designated school coordinators. Completion required approximately 30 minutes for students and 25 minutes for teachers. In schools with adequate technological infrastructure, questionnaires were completed online through protected digital platforms,

whereas paper-based versions were used in schools with limited technological resources.

Following quantitative data collection, semi structured interviews were conducted with the selected subsample. Teacher interviews explored perceptions related to cyberbullying, educational management practices, attitudes toward artificial intelligence, and professional training needs. Student interviews investigated online communication experiences, perceptions of digital empathy, relational experiences, and opinions regarding the educational use of emerging technologies. The semi-structured interviews were conducted using a common thematic guide adapted to the participant group. Student interviews focused on experiences of online communication, emotional awareness in digital interactions, perceptions of cyberbullying, and attitudes toward emerging technologies. Teacher interviews addressed cyberbullying management, relational dynamics, perceived training needs, and the educational and ethical implications of artificial intelligence. Interviews were conducted in a confidential setting, and the material was anonymized before analysis.

All collected data were anonymized through alphanumeric coding procedures and stored in protected digital archives accessible exclusively to the research team.

2.4 Measures

Bullying and cyberbullying

Bullying and cyberbullying were assessed using the Florence Bullying and Victimization Scales developed by Palladino, Nocentini, and Menesini (2015). The instrument represents one of the main validated European scales for the simultaneous assessment of traditional bullying, cyberbullying, victimization, and cybervictimization during adolescence.

The scale includes items related to verbal aggression, social exclusion, intimidation, dissemination of offensive online content, digital harassment, and unauthorized sharing of images or information. Participants reported the frequency of experienced or enacted behaviors during the previous two months using a 5-point Likert scale ranging from 1, never, to 5, several times a week.

In the present study, internal consistency coefficients were satisfactory for both traditional bullying dimensions, $\alpha = .84$, and cyberbullying dimensions, $\alpha = .88$.

Socio emotional competencies

Socio emotional competencies were assessed through the Social Emotional Competence Questionnaire, SECQ, developed by Zhou and Ee (2012). The instrument includes 25 items divided into five dimensions, self-awareness, social awareness, self-management, relationship management, and responsible decision making. Responses were collected using a 6-point Likert scale. Previous studies demonstrated good psychometric properties for the instrument, with alpha coefficients above .80.

Empathy

Empathy was assessed using the Basic Empathy Scale, BES, developed by Jolliffe and Farrington (2006). The scale includes 20 items aimed at measuring both cognitive and affective empathy. Responses were recorded on a 5-point Likert scale ranging from strongly disagree to strongly agree. The BES has been widely used in studies concerning bullying and cyberbullying during adolescence and demonstrates good reliability and cross-cultural validity.

Digital affective literacy

Digital affective literacy was assessed through an adapted measure derived from the Digital Emotional Intelligence Scale proposed by MacCann et al. (2022) and supplemented with items specifically developed for the present study in order to address emotional processes occurring within digitally mediated interactions. The adaptation focused on four content areas relevant to the aims of the study: recognition of emotions in digital communication, understanding of the emotional consequences of online interactions, reflective behavior before sharing or responding to digital content, and recognition of manipulative or aggressive communication patterns.

The resulting of the adapted Digital Affective Literacy Scale consisted of 18 items rated on a 5-point Likert scale, with higher scores indicating greater digital affective literacy. Given the adaptation of the original measure and the inclusion of newly developed items, the internal structure of the scale was examined through exploratory factor analysis before its use in the main analyses. The analysis supported the adequacy of the resulting structure for the present sample. Internal consistency was also satisfactory, with an overall Cronbach's alpha coefficient of .87. The scale was therefore treated as an adapted study-specific measure rather than as an independently established standardized instrument.

School climate

Perceived school climate was assessed using selected dimensions of the Delaware School Climate Survey, DSCS, developed by Bear et al. (2011), with particular attention to peer relationships, teacher student relationships, emotional safety, and perceptions of inclusiveness.

Teachers' preparedness and attitudes toward artificial intelligence

Teachers perceived efficacy in managing bullying and cyberbullying was assessed using an adapted version of the Teacher Efficacy Scale for Bullying Prevention proposed by Yoon et al. (2016).

Attitudes toward artificial intelligence and emotionally aware technologies were explored using an adapted version of the AI Attitude Scale developed by Schepman and Rodway (2020), focusing on perceived usefulness, ethical concerns, and educational potential.

2.5 Intervention

Although the study did not include a structured experimental protocol, it examined educational and preventive practices already implemented within participating schools. Specifically, the research considered socio emotional learning activities, peer education programs, cooperative strategies, digital citizenship workshops, emotional literacy pathways, and school anti bullying policies.

In three participating schools, educational experimentation involving emerging technologies was also present, including adaptive platforms supported by artificial intelligence, digital simulations aimed at empathy development, and emotionally responsive applications used during collaborative activities. The analysis focused not only on the presence of technologies, but especially on the pedagogical meaning attributed to their use and on their systematic or occasional integration within school curricula.

2.6 Statistical Analysis

Statistical analyses were conducted using IBM SPSS Statistics version 29. Initially, descriptive statistics including frequencies, percentages, means, and standard deviations were calculated. Internal consistency reliability of the standardized scales was assessed through Cronbach's alpha coefficients, which ranged from .81 to .90 in the present study. Independent samples t tests were used to analyze gender differences regarding empathy, socio emotional competencies, digital affective literacy, and involvement in cyberbullying. Analyses of variance, ANOVA, were conducted to compare

participants according to country and school type, followed by Bonferroni post hoc analyses. Relationships among empathy, socio emotional competencies, digital affective literacy, school climate, and cyberbullying were examined through Pearson correlations. Subsequently, multiple linear regression analyses were conducted to identify the main predictors of cybervictimization and cyberaggression. Independent variables included empathy, emotional self-regulation, digital affective literacy, school climate, and frequency of digital technology use.

For the teacher sample, hierarchical regression analyses were conducted to verify whether previous training experiences in digital education, bullying prevention, and artificial intelligence predicted perceived professional efficacy in managing online relational dynamics.

Qualitative interview data were analyzed through thematic analysis following the six-phase approach proposed by Braun and Clarke (2006). The analysis involved familiarization with the interview material, generation of initial codes, identification and review of candidate themes, definition and naming of the final themes, and integration of the themes into the interpretation of the quantitative findings. Two researchers independently coded the interview material. Coding discrepancies were discussed until agreement was reached through peer comparison and interpretative triangulation.

3.RESULTS

Gender Differences Across the Main Study Variables

Independent samples t tests were conducted to examine gender differences across the principal constructs assessed through the Florence Bullying and Victimization Scales, the Social Emotional Competence Questionnaire, SECQ, the Basic Empathy Scale, BES, the adapted Digital Affective Literacy Scale, the Delaware School Climate Survey, DSCS, and the AI Attitude Scale.

The analyses revealed several statistically significant gender differences. Male students reported significantly higher scores in both traditional bullying and cyberbullying behaviors compared to female students. In contrast, female students showed significantly higher levels of socio emotional competencies, empathy, and digital affective literacy. No statistically significant gender differences emerged regarding attitudes toward artificial intelligence in education, although female students reported slightly higher ethical concerns related to emotionally aware technologies.

Regarding the Florence Bullying and Victimization Scales, male students obtained higher mean scores in traditional bullying perpetration, $M = 2.04$, SD

= 0.71, compared to females, M = 1.75, SD = 0.59, t(590) = 5.42, p < .001, d = 0.45. Similarly, cyberbullying scores were significantly higher among males, M = 1.89, SD = 0.66, than females, M = 1.60, SD = 0.53, t(590) = 5.92, p < .001, d = 0.49. No statistically significant differences emerged for cybervictimization scores, although females reported slightly higher victimization experiences.

Concerning socio emotional competencies measured through the SECQ, female students showed significantly higher overall scores, M = 4.51, SD = 0.63, compared to males, M = 4.12, SD = 0.68, t(590) = -7.24, p < .001, d = 0.60. Similar patterns emerged across the subdimensions related to social awareness and relationship management.

The analyses conducted on the Basic Empathy Scale revealed significantly higher levels of both cognitive and affective empathy among female students. The overall empathy score was significantly higher for females, M = 4.02, SD = 0.58, than for males, M = 3.54, SD = 0.61, t(590) = -9.81, p < .001, d = 0.81.

With regard to digital affective literacy, female students demonstrated significantly higher competencies in recognizing emotions in digital communication and reflecting on the emotional consequences of online interactions. The overall digital affective literacy score was significantly higher among females, M = 4.11, SD = 0.64, than males, M = 3.75, SD = 0.70, t(590) = -6.54, p < .001, d = 0.54.

For the Delaware School Climate Survey, females reported slightly more positive perceptions of school climate, particularly regarding emotional safety and teacher student relationships. However, the differences were smaller compared to those observed for empathy and socio emotional competencies, t(590) = -2.30, p = .022, d = 0.19.

Finally, no statistically significant gender differences emerged in the AI Attitude Scale total scores. Both male and female students generally reported moderately positive attitudes toward the educational use of artificial intelligence. Nevertheless, female students expressed marginally higher ethical concerns regarding emotional simulation and privacy issues associated with AI based educational systems. The level of statistical significance was set at p < .05 and, where appropriate, effect sizes were reported using Cohen's d and partial eta squared (Tab. 1).

Table 1: Gender Differences Across the Main Study Variables

Scale	Male Students M ± SD	Female Students M ± SD	t	p	Cohen's d
Traditional Bullying	2.04 ± 0.71	1.75 ± 0.59	5.42	< .001	0.45

Scale	Male Students M ± SD	Female Students M ± SD	t	p	Cohen's d
Cyberbullying	1.89 ± 0.66	1.60 ± 0.53	5.92	< .001	0.49
Cybervictimization	2.15 ± 0.77	2.21 ± 0.81	-0.92	.357	0.08
Social Emotional Competence Questionnaire (SECQ)	4.12 ± 0.68	4.51 ± 0.63	-7.24	< .001	0.60
Basic Empathy Scale (BES)	3.54 ± 0.61	4.02 ± 0.58	-9.81	< .001	0.81
Adapted Digital Affective Literacy Scale	3.75 ± 0.70	4.11 ± 0.64	-6.54	< .001	0.54
Delaware School Climate Survey (DSCS)	3.35 ± 0.57	3.46 ± 0.59	-2.30	.022	0.19
AI Attitude Scale	3.49 ± 0.68	3.58 ± 0.72	-1.56	.119	0.13

Note. M = mean; SD = standard deviation; d = Cohen's d. p values < .001 are reported as p < .001.

3.2 Reliability Analysis of Standardized Measures

Internal consistency reliability of the standardized scales was assessed through Cronbach's alpha coefficients. In the present study, the Florence Bullying and Victimization Scales showed good reliability for both the traditional bullying dimension, $\alpha = .84$, and the cyberbullying dimension, $\alpha = .88$. The Social Emotional Competence Questionnaire, SECQ, demonstrated high internal consistency, $\alpha = .90$. The Basic Empathy Scale, BES, showed satisfactory reliability, $\alpha = .86$. The adapted Digital Affective Literacy Scale presented good internal consistency, $\alpha = .87$. The selected dimensions of the Delaware School Climate Survey showed an overall Cronbach's alpha coefficient of .82. Finally, the adapted Teacher Efficacy Scale for Bullying Prevention and the AI Attitude Scale demonstrated acceptable to high reliability, with alpha coefficients of .85 and .81, respectively. Overall, Cronbach's alpha coefficients ranged from .81 to .90, indicating satisfactory internal consistency for all measures included in the study.

3.3 Descriptive Statistics

Descriptive statistics including frequencies, percentages, means, and standard deviations were calculated for all sociodemographic variables and the main study constructs. Among the 592 students included in the study, 308 were female, 52.0%, and 284 were male, 48.0%. The mean age of the student sample was 16.1 years, SD = 1.2. Regarding school type, 238 students, 40.2%, attended academic high schools, 214 students, 36.1%, attended technical institutes, and 140 students, 23.7%, attended vocational schools. Concerning digital technology use, 91.4% of students reported daily use of social media platforms for more than three hours per day, while 74.8% indicated frequent use of online messaging applications during school related activities. Approximately 62.3% of students reported having witnessed at least one episode of online aggression during the previous two months, whereas 28.5% reported having experienced at least one form of cybervictimization.

The teacher sample consisted of 92 participants, including 61 females, 66.3%, and 31 males, 33.7%. The mean teaching experience was 14.3 years, SD = 6.7. Regarding disciplinary areas, 31.5% of teachers belonged to humanities subjects, 27.2% to scientific disciplines, 19.6% to technological subjects, and 21.7% to physical education and sports sciences. Table 2 presents the descriptive statistics related to the principal study variables.

Table 2: Descriptive Statistics for the Main Study Variables.

Variable	Mean	SD	Minimum	Maximum
Traditional bullying	1.89	0.67	1.00	4.75
Cyberbullying	1.74	0.61	1.00	4.40
Cybervictimization	2.11	0.79	1.00	4.90
Socio emotional competencies	4.32	0.71	2.10	5.90
Cognitive empathy	3.88	0.65	1.40	5.00
Affective empathy	3.76	0.69	1.20	5.00
Adapted Digital affective literacy	3.94	0.73	1.80	5.00
Perceived school climate	3.41	0.58	1.70	4.00
Teachers' perceived efficacy	3.67	0.62	2.10	5.00
AI in education	3.54	0.70	1.60	5.00

Note. Student-related variables are based on the student sample (n = 592), whereas teachers' perceived efficacy is based on the teacher sample (n = 92). M = mean; SD = standard deviation.

Students showed overall moderate to high levels of socio emotional competencies, empathy, and digital affective literacy. Mean scores related to cyberbullying perpetration were generally low, whereas cybervictimization scores appeared moderately higher, suggesting a greater prevalence of victimization experiences compared to self-reported aggressive online behaviors.

Teachers reported moderate levels of perceived efficacy in managing bullying and cyberbullying dynamics, while attitudes toward artificial intelligence in educational settings were generally positive, although accompanied by variability associated with ethical concerns and previous technological training experiences.

3.4 Differences Across Participating School Contexts and According to School Type

Analyses of variance, ANOVA, were conducted to compare participants across the six participating school contexts, identified according to their country of location, and according to school type across the principal constructs assessed in the study. Bonferroni post hoc analyses were subsequently performed to identify specific group differences.

Significant differences emerged across the participating school contexts regarding cyberbullying involvement, socio emotional competencies, digital affective literacy, and perceived school climate. In particular, students attending the participating schools located in Germany and the United Kingdom reported significantly higher levels of digital affective literacy and more positive perceptions of school climate than students attending the participating schools located in Italy and Greece.

For the Florence Bullying and Victimization Scales, ANOVA revealed significant differences in cyberbullying scores across countries, $F(5, 586) = 6.42$, $p < .001$, $\eta^2 = .05$. Bonferroni post hoc comparisons indicated that students from Italy, $M = 1.93$, $SD = 0.65$, and Greece, $M = 1.89$, $SD = 0.68$, reported significantly higher cyberbullying scores compared to students from Germany, $M = 1.52$, $SD = 0.49$, and the United Kingdom, $M = 1.49$, $SD = 0.47$.

Significant differences also emerged for socio emotional competencies measured through the SECQ, $F(5, 586) = 8.11$, $p < .001$, $\eta^2 = .06$. Students attending the participating schools located in Germany and the United Kingdom showed the highest scores, whereas lower levels were observed among participants attending the participating school located in Italy and Greece. Bonferroni analyses confirmed statistically significant differences particularly between Germany and Italy, as well as between the United Kingdom and Greece.

Regarding the Basic Empathy Scale, moderate but significant differences emerged across countries, $F(5, 586) = 3.98$, $p = .002$, $\eta^2 = .03$. Students attending the participating schools located in France and Spain reported slightly higher empathy scores compared to students attending the participating school located in Germany and Greece.

The adapted Digital Affective Literacy Scale showed one of the most pronounced differences among countries, $F(5, 586) = 10.34$, $p < .001$, $\eta^2 = .08$. Students attending the participating school located in Germany and the United Kingdom reported significantly higher levels of digital affective literacy compared to participants attending the participating school located in Italy and Greece. Bonferroni post hoc analyses indicated that these differences were particularly evident in dimensions related to reflective online behavior and emotional awareness in digital communication.

For the Delaware School Climate Survey, significant differences emerged regarding perceptions of emotional safety and inclusiveness, $F(5, 586) = 4.76$, $p < .001$, $\eta^2 = .04$. Students attending the participating school located in the United Kingdom reported the most positive school climate perceptions overall.

No statistically significant differences across countries emerged for the AI Attitude Scale total score, $F(5, 586) = 1.84$, $p = .103$, although students from technologically advanced school environments reported slightly more favorable attitudes toward the educational use of artificial intelligence.

Analyses according to school type also revealed significant differences. Students attending academic high schools demonstrated significantly higher socio emotional competencies and digital affective literacy compared to students attending vocational schools. Technical institute students reported intermediate scores across most variables.

ANOVA conducted on the SECQ scores according to school type showed significant differences, $F(2, 589) = 7.26$, $p = .001$, $\eta^2 = .02$. Bonferroni post hoc analyses revealed that students attending academic high schools, $M = 4.48$, $SD = 0.62$, scored significantly higher than vocational school students, $M = 4.07$, $SD = 0.71$.

Similarly, digital affective literacy differed significantly across school types, $F(2, 589) = 8.43$, $p < .001$, $\eta^2 = .03$. Academic high school students reported the highest levels of digital affective literacy, followed by technical institute students, whereas vocational school students obtained the lowest scores.

Cyberbullying scores were significantly higher among vocational school students compared to students attending academic high schools, $F(2, 589) = 5.18$, $p = .006$, $\eta^2 = .02$. However, effect sizes remained small to moderate (Tab. 3, 4).

Table 3: Differences Across Participating School Contexts by Country of Location.

Variable	Italy M ± SD	Spain M ± SD	France M ± SD	Germany M ± SD	Greece M ± SD	United Kingdom M ± SD	F	p
Cyberbullying	1.93 ± 0.65	1.71 ± 0.56	1.68 ± 0.54	1.52 ± 0.49	1.89 ± 0.68	1.49 ± 0.47	6.42	< .001
SECQ	4.13 ± 0.66	4.31 ± 0.61	4.39 ± 0.64	4.61 ± 0.58	4.10 ± 0.69	4.58 ± 0.55	8.11	< .001
BES	3.71 ± 0.62	3.92 ± 0.57	3.98 ± 0.59	3.74 ± 0.60	3.68 ± 0.65	3.86 ± 0.56	3.98	.002
Adapted Digital Affective Literacy Scale	3.69 ± 0.71	3.88 ± 0.65	3.96 ± 0.63	4.24 ± 0.57	3.70 ± 0.73	4.28 ± 0.54	10.34	< .001
DSCS	3.31 ± 0.59	3.42 ± 0.53	3.47 ± 0.56	3.51 ± 0.50	3.28 ± 0.62	3.61 ± 0.48	4.76	< .001
AI Attitude Scale	3.49 ± 0.70	3.57 ± 0.66	3.61 ± 0.69	3.65 ± 0.64	3.43 ± 0.72	3.68 ± 0.63	1.84	.103

Note. Country labels indicate the geographical location of each participating school. As only one school was included from each country, between-group differences should be interpreted

as comparisons among the participating school contexts rather than as nationally representative differences. M = mean; SD = standard deviation.

Table 4: Differences According to School Type.

Variable	Academic High Schools M ± SD	Technical Institutes M ± SD	Vocational Schools M ± SD	F	p
SECQ	4.48 ± 0.62	4.29 ± 0.65	4.07 ± 0.71	7.26	.001
BES	3.94 ± 0.58	3.82 ± 0.61	3.61 ± 0.67	5.34	.005
Adapted Digital Affective Literacy Scale	4.18 ± 0.60	3.91 ± 0.66	3.63 ± 0.74	8.43	< .001
Cyberbullying	1.58 ± 0.50	1.73 ± 0.57	1.95 ± 0.69	5.18	.006
DSCS	3.52 ± 0.54	3.41 ± 0.56	3.28 ± 0.61	3.87	.021

Note. M = mean; SD = standard deviation. SECQ = Social Emotional Competence Questionnaire; BES = Basic Empathy Scale; DSCS = Delaware School Climate Survey.

Pearson Correlation Analyses

Relationships among empathy, socio emotional competencies, digital affective literacy, school climate, and cyberbullying were examined through Pearson correlation analyses. The results revealed several significant associations consistent with the theoretical framework of the study.

Higher levels of empathy were positively associated with socio emotional competencies, digital affective literacy, and more positive perceptions of school climate. In contrast, cyberbullying behaviors were negatively associated with empathy, socio emotional competencies, and digital affective literacy, suggesting that students characterized by lower emotional awareness and weaker relational competencies were more likely to report aggressive online behaviors.

The strongest positive correlation emerged between empathy and socio emotional competencies, $r = .68$, $p < .001$, indicating that students with greater empathic abilities also demonstrated stronger emotional regulation, social awareness, and relationship management skills. Digital affective literacy was moderately and positively associated with both empathy, $r = .59$, $p < .001$, and socio emotional competencies, $r = .63$, $p < .001$, suggesting that

emotionally aware online behavior is closely linked to broader socio emotional functioning.

Perceived school climate also showed significant positive associations with empathy, $r = .42$, $p < .001$, socio emotional competencies, $r = .51$, $p < .001$, and digital affective literacy, $r = .47$, $p < .001$. Students reporting more inclusive and emotionally supportive school environments tended to display higher relational competencies and greater emotional awareness in digital communication.

Cyberbullying demonstrated significant negative correlations with all protective variables included in the analysis. In particular, cyberbullying was negatively associated with empathy, $r = -.49$, $p < .001$, socio emotional competencies, $r = -.56$, $p < .001$, digital affective literacy, $r = -.53$, $p < .001$, and perceived school climate, $r = -.39$, $p < .001$. These findings suggest that lower levels of emotional competence and weaker perceptions of relational support may contribute to greater involvement in aggressive online behaviors.

Overall, the correlation analyses supported the hypothesis that socio emotional functioning, empathic competencies, digital affective literacy, and positive school climate represent interconnected protective dimensions against cyberbullying involvement within digitally mediated educational contexts (Tab 5; Fig. 1).

Table 5: Pearson Correlations Among the Main Study Variables

Variable	1	2	3	4	5
1. Empathy, BES	—				
2. Socio Emotional Competencies, SECQ	.68***	—			
3. Adapeted Digital Affective Literacy Scale	.59***	.63***	—		
4. School Climate, DSCS	.42***	.51***	.47***	—	
5. Cyberbullying, Florence Scales	-.49***	-.56***	-.53***	-.39***	—

***p < .001.

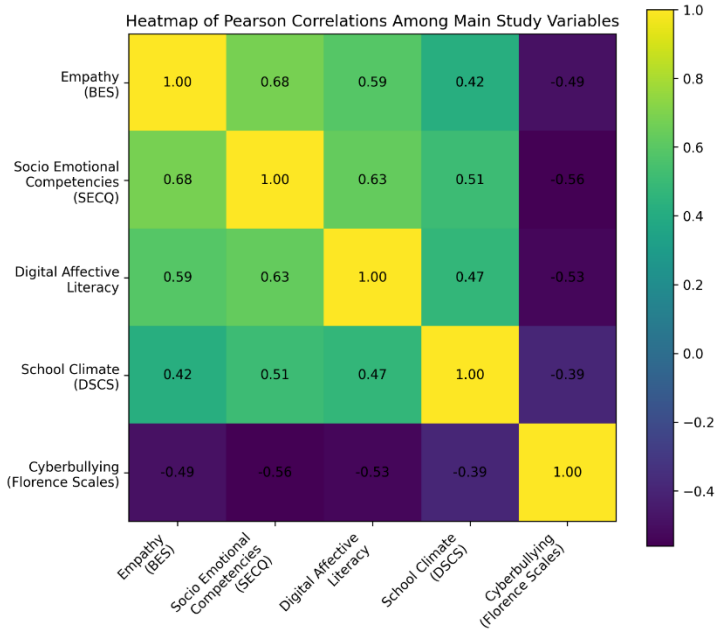


Figure 1: Pearson Correlations Heatmap.

Multiple Linear Regression Analyses

Subsequently, multiple linear regression analyses were conducted to identify the principal predictors of cybervictimization and cyberaggression. Independent variables included empathy, emotional self-regulation, digital affective literacy, perceived school climate, and frequency of digital technology use.

Prior to conducting the regression analyses, assumptions of linearity, normality, homoscedasticity, and absence of multicollinearity were verified. Variance Inflation Factor, VIF, values ranged between 1.21 and 2.04, indicating acceptable levels of multicollinearity among predictors.

Predictors of Cybervictimization

The regression model predicting cybervictimization was statistically significant, $F(5, 586) = 55.15$, $p < .001$, explaining 32% of the variance, $R^2 = .32$, Adjusted $R^2 = .31$.

Among the predictors included in the model, lower perceived school climate emerged as the strongest predictor of cybervictimization, $\beta = -.31$, $p < .001$. Lower digital affective literacy also significantly predicted higher cybervictimization levels, $\beta = -.24$, $p < .001$. Frequency of digital technology use was positively associated with cybervictimization, $\beta = .21$, $p < .001$,

indicating that students reporting more intensive daily digital engagement were more likely to experience online victimization.

Empathy demonstrated a smaller but still significant negative association with cybervictimization, $\beta = -.15$, $p = .002$, while emotional self-regulation also emerged as a significant protective factor, $\beta = -.18$, $p = .001$.

These findings suggest that students characterized by lower emotional awareness, weaker relational support within school environments, and more intensive digital exposure may be more vulnerable to online victimization experiences.

Predictors of Cyberaggression

The regression model predicting cyberaggression was also statistically significant, $F(5, 586) = 81.44$, $p < .001$, accounting for 41% of the variance, $R^2 = .41$, Adjusted $R^2 = .40$. Lower emotional self-regulation emerged as the strongest predictor of cyberaggression, $\beta = -.34$, $p < .001$. Lower empathy was also strongly associated with higher cyberaggressive behaviors, $\beta = -.29$, $p < .001$. Digital affective literacy demonstrated a significant negative association with cyberaggression, $\beta = -.26$, $p < .001$, indicating that students with weaker competencies in understanding emotions within digital interactions were more likely to engage in aggressive online behaviors.

Perceived school climate showed a moderate protective effect, $\beta = -.19$, $p < .001$, whereas frequency of digital technology uses positively predicted cyberaggression, $\beta = .17$, $p = .003$.

Overall, the findings highlighted the central role of socio emotional competencies, emotional regulation, empathy, and digital affective literacy as protective factors against both cybervictimization and cyberaggression within digitally mediated educational contexts (Tab. 6, 7).

Table 6: Multiple Linear Regression Analyses Predicting Cybervictimization.

Predictor	B	SE B	β	t	p
Empathy	-0.18	0.06	-.15	-3.16	.002
Emotional self regulation	-0.21	0.06	-.18	-3.42	.001
Adapted Digital affective literacy	-0.29	0.05	-.24	-5.37	< .001
School climate	-0.36	0.06	-.31	-6.41	< .001

Predictor	B	SE B	β	t	p
Frequency of digital technology use	0.19	0.05	.21	4.48	< .001

Model statistics: $R^2 = .32$, Adjusted $R^2 = .31$, $F(5, 586) = 55.15$, $p < .001$.
Note. B = unstandardized regression coefficient; SE B = standard error; β = standardized regression coefficient.

Table 7: Multiple Linear Regression Analyses Predicting Cyberaggression.

Predictor	B	SE B	β	t	p
Empathy	-0.31	0.05	-.29	-6.11	< .001
Emotional self regulation	-0.38	0.05	-.34	-7.02	< .001
Adapted Digital affective literacy	-0.27	0.05	-.26	-5.73	< .001
School climate	-0.22	0.05	-.19	-4.21	< .001
Frequency of digital technology use	0.15	0.05	.17	3.01	.003

Model statistics: $R^2 = .41$, Adjusted $R^2 = .40$, $F(5, 586) = 81.44$, $p < .001$.
Note. B = unstandardized regression coefficient; SE B = standard error; β = standardized regression coefficient.

Hierarchical Regression Analyses for the Teacher Sample

For the teacher sample, hierarchical regression analyses were conducted to examine whether previous training experiences in digital education, bullying prevention, and artificial intelligence significantly predicted perceived professional efficacy in managing online relational dynamics.

Prior to the analyses, assumptions of normality, linearity, homoscedasticity, and absence of multicollinearity were verified. Variance Inflation Factor, VIF, values ranged from 1.18 to 1.87, indicating acceptable levels of multicollinearity among predictors.

A two-step hierarchical regression model was performed. In Step 1, demographic and professional variables, years of teaching experience and frequency of digital technology use in educational practice, were entered as

control variables. In Step 2, previous training experiences in digital education, bullying prevention, and artificial intelligence were included.

The first model was statistically significant, $F(2, 89) = 6.14$, $p = .003$, explaining 12% of the variance in perceived professional efficacy, $R^2 = .12$. Frequency of digital technology use emerged as a significant positive predictor, $\beta = .28$, $p = .007$, whereas years of teaching experience showed a weaker and non-significant association.

After the inclusion of training related variables in Step 2, the overall model significantly improved, $\Delta R^2 = .29$, $\Delta F(3, 86) = 14.09$, $p < .001$. The final model explained 41% of the variance in teachers perceived efficacy in managing online relational dynamics, $R^2 = .41$, Adjusted $R^2 = .38$.

Among the predictors included in the final model, previous training in bullying prevention emerged as the strongest predictor of perceived professional efficacy, $\beta = .36$, $p < .001$. Training in digital education also showed a significant positive effect, $\beta = .29$, $p = .002$, while previous training related to artificial intelligence demonstrated a smaller but still significant contribution, $\beta = .21$, $p = .011$.

These findings suggest that teachers who had participated in structured training experiences related to digital citizenship, cyberbullying prevention, and emerging technologies perceived themselves as more competent in managing technologically mediated relational dynamics and supporting students within digital educational environments (Tab. 8).

Table 8: Hierarchical Regression Analyses Predicting Teachers' Professional Efficacy in Managing Online Relational Dynamics.

Predictor	B	SE B	β	t	p
Step 1					
Years of teaching experience	0.09	0.05	.14	1.72	.089
Frequency of digital technology use	0.31	0.11	.28	2.79	.007
Step 2					
Training in bullying prevention	0.42	0.09	.36	4.68	< .001
Training in digital education	0.35	0.10	.29	3.21	.002
Training in artificial intelligence	0.24	0.09	.21	2.61	.011

Step 1: $R^2 = .12$, Adjusted $R^2 = .10$, $F(2, 89) = 6.14$, $p = .003$. Step 2: $R^2 = .41$, Adjusted $R^2 = .38$, $\Delta R^2 = .29$, $\Delta F(3, 86) = 14.09$, $p < .001$.

Qualitative Findings: Thematic Analysis

Qualitative interview data were analyzed through thematic analysis following the six-phase approach proposed by Braun and Clarke (2006). Two researchers independently coded the interview transcripts in order to improve interpretative reliability and reduce subjective bias during the analytical process.

The analysis initially involved repeated reading of the transcripts to ensure familiarization with the data. Subsequently, preliminary codes were generated and progressively grouped into broader thematic categories. Differences in coding were discussed until agreement was reached through peer comparison and interpretative triangulation. The thematic analysis identified five principal themes emerging across teacher and student interviews:

1. Emotional disconnection in online communication

   Participants frequently described digital interactions as emotionally less controllable than face-to-face communication. Students reported that online environments often reduced awareness of the emotional consequences of aggressive behaviors, facilitating impulsive communication and the normalization of offensive language. This perception was reflected in participants' accounts of online exchanges in which the emotional reaction of the recipient was less immediately visible. As one student explained, "Online, people often say things they would never say face to face, because they do not immediately see how the other person reacts." (Student, S07)
2. Empathy as a protective factor against cyberbullying

   Both teachers and students highlighted empathy as a central protective dimension in preventing online aggression. Participants emphasized the importance of educational activities capable of fostering emotional awareness, perspective taking, and reflective communication practices. Several accounts stressed the importance of considering how a message may affect another person before posting, commenting, or sharing content online. As one student observed, "Before posting something about someone, we should try to imagine how we would feel if the same thing were written about us." (Student, S12)
3. Ambivalent perceptions of artificial intelligence in education

   Teachers generally recognized the potential of artificial intelligence and emotionally aware technologies for supporting inclusion, emotional recognition, and student engagement. At the same time, participants expressed concerns regarding excessive technological mediation, emotional simulation, privacy, and the possible weakening of authentic human relationships. This ambivalence emerged particularly clearly in teachers' accounts, which combined recognition of the educational potential of

artificial intelligence with caution regarding its relational and ethical implications. As one teacher stated, “Artificial intelligence can be useful for helping students reflect on emotions, but it should remain a support tool and should never replace the relationship with the teacher.” (Teacher, T05)

4. Need for structured teacher training
   Many teachers reported feeling insufficiently prepared to manage cyberbullying and technologically mediated relational conflicts. Participants emphasized the need for specific professional development programs integrating digital education, socio-emotional learning, and ethical reflection on artificial intelligence. Teachers frequently described the rapid evolution of digital communication as a challenge that was not always adequately addressed by their previous professional preparation. One teacher noted, “We are often expected to manage situations that develop online, but many teachers have never received specific training on how to deal with cyberbullying or digital conflicts” (Teacher, T08).
5. Importance of school climate and relational support
   Students consistently described positive teacher-student relationships and inclusive school environments as crucial protective factors against bullying and cyberbullying. Schools characterized by open communication and emotional support were perceived as safer and more capable of addressing online relational difficulties. Participants particularly emphasized the importance of having trusted adults within the school environment with whom online problems could be discussed openly and without fear of judgment. As one student reported, “When you know that there is a teacher you can talk to without being judged, it is much easier to ask for help when something happens online.” (Student, S19).

Overall, the qualitative findings supported and enriched the quantitative results by providing participants’ direct perspectives on the interconnected role of empathy, socio-emotional competencies, digital affective literacy, teacher preparedness, and relational support in cyberbullying prevention within digitally mediated school contexts. The interview excerpts also illustrated how these dimensions were experienced and interpreted in everyday educational and online interactions.

4. Discussion

The present study aimed to investigate the relationship between cyberbullying, socio emotional competencies, empathy, digital affective literacy, and the pedagogical use of emerging technologies within digitally mediated educational contexts. Through a comparative observational design

conducted across six school contexts located in different European countries, the research explored how emotional and relational dimensions interact with technological mediation in shaping online aggressive behaviors and educational prevention practices. Particular attention was devoted to the role of artificial intelligence, emotionally aware technologies, and teacher training in fostering safer and more inclusive digital learning environments.

The findings highlighted the central role of socio emotional competencies and empathy as protective factors against cyberbullying involvement. Students characterized by higher levels of empathy, emotional regulation, and relational awareness reported lower engagement in cyberaggressive behaviors and lower exposure to online victimization. These results suggest that cyberbullying cannot be interpreted exclusively as a technological phenomenon, but rather as a relational and emotional issue deeply connected to the quality of students' interpersonal competencies. In digitally mediated interactions, where immediate emotional feedback is often reduced, the capacity to recognize the emotional consequences of one's actions becomes particularly important (Arató et al., 2020). Students with stronger empathic abilities may be more capable of understanding the impact of harmful online communication and therefore less likely to engage in aggressive digital behaviors (Al-Qallaf, 2025).

These findings are consistent with previous literature emphasizing the protective function of empathy and socio emotional learning in bullying prevention. Several studies have demonstrated that low levels of empathy are associated with increased aggressive behavior, moral disengagement, and difficulties in perspective taking within online interactions. The present study extends these findings by highlighting the relevance of empathy specifically within technologically mediated educational contexts, where digital communication may facilitate emotional distancing and impulsive behavior. Moreover, the strong association observed between empathy and socio emotional competencies reinforces theoretical perspectives suggesting that emotional regulation, social awareness, and relational management should be considered interconnected dimensions rather than isolated skills.

The analyses also revealed significant gender differences across the principal variables included in the study. Male students reported higher levels of traditional bullying and cyberbullying behaviors, whereas female students demonstrated significantly higher levels of empathy, socio emotional competencies, and digital affective literacy (Schoeps et al., 2018). These findings may reflect different socialization processes related to emotional expression, communication styles, and conflict management during adolescence. Female students may be more accustomed to relational and emotionally reflective forms of communication, while male students may

experience greater exposure to competitive or aggressive interaction patterns, including within digital environments (Cebollero-Salinas et al., 2024).

At the same time, the absence of significant gender differences in attitudes toward artificial intelligence suggests that emerging technologies are increasingly normalized across both male and female adolescents. This finding is particularly relevant because it indicates that the educational integration of artificial intelligence may not necessarily reproduce traditional gender divisions in technological engagement (Zych et al., 2018). However, female students reported slightly greater ethical concerns regarding emotionally aware technologies, especially in relation to privacy and emotional manipulation. Such concerns may reflect higher sensitivity toward relational authenticity and emotional implications of digital interaction (Garaigordobil et al., 2009).

Another relevant result concerns the role of digital affective literacy. Students with higher levels of digital affective literacy reported lower involvement in cyberbullying behaviors and more positive perceptions of online communication. This finding suggests that the ability to interpret emotions in digital interactions, reflect before sharing online content, and recognize manipulative or aggressive communication patterns represents a significant protective factor in technologically mediated environments. Digital communication differs substantially from face-to-face interaction because emotional cues are often fragmented, delayed, or ambiguous (Jiang, 2024). Consequently, students require specific competencies to navigate digital spaces responsibly and empathetically.

The positive association between digital affective literacy and socio emotional competencies further supports the idea that emotional education should not be separated from digital education. Traditional approaches to digital citizenship often focus primarily on technical safety, online risks, or responsible internet use. However, the present findings suggest that effective cyberbullying prevention requires a broader educational perspective integrating emotional awareness, relational responsibility, and reflective communication practices within digital contexts. This interpretation aligns with recent educational literature emphasizing the importance of combining socio emotional learning with media education and critical digital literacy (Paixão et al., 2018).

Differences also emerged across the six participating school contexts. Students attending the schools located in Germany and the United Kingdom reported higher levels of digital affective literacy, socio emotional competencies, and more positive perceptions of school climate than those attending some of the other participating schools. However, these findings

should be interpreted as differences between the specific school contexts included in the study rather than as evidence of systematic differences between national educational systems (Cefai, 2018). Because only one school was recruited from each country, school-level characteristics, local educational practices, institutional climate, and geographical context cannot be disentangled from country location. Accordingly, the observed differences should be considered exploratory and context-specific. Future multicenter studies including multiple schools within each country are needed to determine whether similar patterns can be replicated at the national level.

Similarly, the higher cybervictimization scores observed in the participating schools located in Italy and Greece should be interpreted as characteristics of the sampled contexts rather than as estimates of national prevalence. These differences may reflect multiple school-level, relational, and contextual factors that could not be separately examined within the present design. Previous comparative European studies have similarly highlighted variability in cyberbullying prevalence and prevention strategies across educational systems. The present research contributes to this literature by suggesting that differences in digital affective literacy and socio emotional education may partially explain cross national variability in online aggressive behaviors (Cefai et al., 2021).

The analyses concerning school type also produced meaningful results. Students attending academic high schools reported significantly higher levels of socio emotional competencies and digital affective literacy compared to vocational school students. Conversely, vocational school students reported higher cyberbullying scores. These findings may be interpreted in relation to differences in educational climate, socio cultural background, school resources, and pedagogical priorities across school pathways. Academic high schools may provide greater opportunities for reflective discussion, collaborative learning, and socio emotional development, whereas vocational contexts may experience higher levels of relational vulnerability and fewer structured opportunities for emotional education (Grund, & Holst, 2023).

One of the most significant findings of the study concerns the predictive role of emotional self-regulation, empathy, and digital affective literacy in explaining cyberaggression and cybervictimization. The regression analyses demonstrated that lower emotional self-regulation represented the strongest predictor of cyberaggressive behavior. This finding suggests that online aggression may frequently emerge from impulsive emotional reactions combined with reduced awareness of consequences within digitally mediated communication. Similarly, lower empathy and weaker digital affective literacy significantly predicted higher involvement in cyberbullying. These results reinforce the interpretation of cyberbullying as a phenomenon deeply

connected to emotional and relational functioning rather than merely technological misuse (Segura et al., 2020).

Perceived school climate emerged as a significant protective factor against both cybervictimization and cyberaggression. Students perceiving their school environment as inclusive, emotionally supportive, and relationally safe reported lower involvement in online aggressive dynamics. This finding highlights the continuity between offline and online relational climates. Digital aggression does not develop in isolation from school culture, but is strongly influenced by the quality of interpersonal relationships, communication practices, and institutional support experienced by students within educational settings (Holfeld, & Leadbeater, 2017).

The teacher related findings further reinforce the importance of educational support and professional preparation. Teachers who had participated in training experiences related to bullying prevention, digital education, and artificial intelligence reported significantly higher perceived efficacy in managing online relational dynamics. This result suggests that professional preparedness cannot rely solely on general teaching experience, but requires specific competencies connected to digital communication, socio emotional learning, and ethical reflection on emerging technologies (Bradshaw et al., 2013).

The qualitative findings strongly supported and enriched the quantitative results. Both students and teachers described online communication as emotionally less controllable and more likely to facilitate impulsive or aggressive interactions. Participants repeatedly emphasized the importance of empathy, relational support, and emotionally aware educational practices in preventing cyberbullying. At the same time, the interviews revealed ambivalent perceptions regarding artificial intelligence and emotionally responsive technologies. While participants recognized the potential of these tools for promoting inclusion, emotional recognition, and engagement, they also expressed concerns regarding emotional simulation, privacy, and the risk of weakening authentic human relationships.

These qualitative insights are particularly important because they highlight the need for a critical pedagogical approach to artificial intelligence in education. Emerging technologies should not be interpreted as autonomous solutions to cyberbullying prevention, but rather as tools whose educational value depends on the pedagogical frameworks within which they are integrated. Artificial intelligence may support emotional education and relational awareness, but it cannot replace meaningful human interaction, teacher mediation, and the ethical dimensions of educational relationships (Antonenko, 2015).

The study presents several strengths. First, the comparative European design allowed the exploration of cyberbullying and digital affective literacy across school contexts located in different European countries. Second, the mixed methods approach provided both quantitative evidence and qualitative depth, allowing a more comprehensive understanding of technologically mediated relational dynamics. Third, the integration of socio emotional competencies, digital affective literacy, artificial intelligence, and school climate within a single analytical framework represents an innovative contribution to existing literature.

Nevertheless, some limitations should also be acknowledged. The cross-sectional nature of the study does not allow causal inferences regarding the relationships among the analyzed variables. Furthermore, data were based primarily on self-report measures, which may be influenced by social desirability bias and subjective interpretation. The purposive selection of schools and voluntary participation of students and teachers may also limit the generalizability of the findings to all European educational contexts. In addition, the Digital Affective Literacy Scale included study-specific adaptations and newly developed items. Although its internal consistency was satisfactory and its structure was explored within the present sample, further independent psychometric validation is needed before the measure can be considered a fully standardized instrument. A further limitation concerns the inclusion of only one school from each participating country. Consequently, countries of location were completely confounded with school membership, and the observed between-group differences cannot be attributed to national educational systems or interpreted as nationally representative patterns. These findings should therefore be regarded as exploratory comparisons among the specific school contexts included in the study. Future research should adopt a multilevel multicenter design including several schools within each country in order to distinguish school-level from country-level effects. Lastly, although the study examined attitudes toward artificial intelligence and emotionally aware technologies, the actual implementation of such technologies within schools remained relatively limited and heterogeneous across countries.

5.Conclusions

The present study highlighted the complex relationship between cyberbullying, socio emotional competencies, empathy, digital affective literacy, and technologically mediated educational environments within

school contexts located in different European countries. The findings suggest that cyberbullying should not be interpreted exclusively as a technological problem, but rather as a multidimensional educational and relational phenomenon strongly influenced by emotional awareness, school climate, and the quality of interpersonal relationships. In particular, empathy, emotional self-regulation, and digital affective literacy emerged as significant protective factors against both cyberaggression and cybervictimization, while positive school climate and teacher preparedness appeared crucial for promoting safer and more inclusive digital learning environments.

The results also emphasized the increasingly strategic role of teacher training and critical digital education in contemporary schools. Although artificial intelligence and emotionally aware technologies may offer innovative opportunities for emotional education and cyberbullying prevention, their educational effectiveness depends largely on the pedagogical frameworks within which they are implemented. The study therefore supports the need for integrated educational approaches capable of combining socio emotional learning, digital citizenship, ethical reflection, and critical use of emerging technologies in order to strengthen students' relational well-being and responsible online participation.

Future research should therefore consider longitudinal designs capable of examining the evolution of cyberbullying and digital affective literacy over time, as well as intervention studies evaluating the effectiveness of socio emotional and AI supported educational programs. Greater attention should also be devoted to ethical dimensions related to emotionally aware technologies, particularly regarding privacy, emotional authenticity, and algorithmic bias in educational contexts. Overall, the findings suggest that cyberbullying prevention requires an integrated educational perspective in which socio emotional competencies, empathy, digital affective literacy, and teacher training are considered fundamental dimensions for promoting relational well-being within increasingly digitalized school environments.

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