

EXPLORING DIGITAL CITIZENSHIP AND ITS INFLUENCE ON ADOLESCENTS' MENTAL HEALTH: A SURVEY OF SCHOOL AND PARENT ROLES

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ABSTRACT

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As global concern grows regarding the impact of digital technology on adolescents' mental health, utilizing digital citizenship as a preventive tool is more crucial than ever. This study aimed to identify the personal, family, and school-related factors that influence the development of adolescents' digital citizenship and to examine how distinct components of digital citizenship relate to adolescents' mental health. Our study in Bangkok adopted a Digital Citizenship Scale called the S.A.F.E. model, the leading character of Self-identity in digital environment, Activity online, Fluency for digital tools, and Ethics for digital environment. These components enable individuals to navigate the digital world safely, respectfully, and knowledgeably. This study assessed digital citizenship and mental health among 952 secondary school and vocational students. The results show the relationship between digital citizenship and adolescents' mental health, with significant findings consistently observed at a moderate level across all S.A.F.E. dimensions. The S.A.F.E. components contribute to the negative impact of excessive internet use, worsening student mental health. In addition, digital parenting (β , .142; 95% CI, 0.86–1.13) is a significant positive predictor of digital citizenship, showing a strong association with higher levels of digital citizenship. The intensity of teaching with technology use (β , .366; 95% CI, 8.85–10.55) also significantly predicts digital citizenship. Our findings highlight the critical roles of schools and parents in promoting digital citizenship, emphasizing the need for effective communication and cooperation between teachers and parents to support adolescents' mental health and responsible digital engagement.

Keywords: Adolescents; digital citizenship; mental health; technology use; educational policy; parental involvement

1. INTRODUCTION

Digital citizenship refers to the responsible use of technology and the internet, while mental health includes emotional, psychological, and social well-being. These two factors are interconnected because online interactions can significantly impact mental health. For example, excessive use of social media has been linked

to increased levels of anxiety and depression, particularly among youth (Twenge et al., 2018). On the other hand, engaging in responsible online behavior, such as participating in supportive online communities, can positively affect emotional well-being (Ribble, 2015). As digital platforms become increasingly embedded in everyday life, promoting healthy digital citizenship is essential to protecting mental health (Livingstone & Helsper, 2010; Subrahmanyam & Greenfield, 2008).

Digital citizenship has emerged as a critical framework for understanding adolescents' mental health in the digital age, encompassing skills that go beyond online interaction. It empowers individuals to use technologies responsibly by understanding personal rights, social responsibilities, and the broader societal implications of digital engagement (Jones & Mitchell, 2016; Ribble, 2011). Guidelines from the International Society for Technology in Education (ISTE) emphasize that effective digital citizenship includes digital literacy, online safety, and ethical practices that directly impact psychological well-being (International Society for Technology in Education, 2019; Ostic et al., 2021; Patton et al., 2013).

Equipping young individuals with essential digital literacy skills, such as recognizing mental health risks and fostering resilient online behaviors, is crucial for reducing cyberbullying, information overload, and social media-induced anxiety (Kuss & Griffiths, 2017; Patchin & Hinduja, 2010). A comprehensive approach to digital citizenship promotes positive online experiences, protects mental health, supports personal growth (Baltezarević et al., 2023), and empowers adolescents to manage digital challenges effectively (Livingstone & Smith, 2014; Miller, 2023).

Most research examines the risk factors and negative impacts of digital behaviors, highlighting consequences like cyberbullying, privacy violations, and excessive screen time, which contribute to anxiety and social isolation (Berdi et al., 2024; Bezerra et al., 2024; Nakshine et al., 2022; Suram & Suram, 2024; Turan, 2024). However, studies show that comprehensive digital citizenship programs can reduce risks by fostering healthier digital habits and improving youth's mental well-being, resilience, and social connectedness. These programs act as a protective mechanism, helping young people cultivate positive digital behaviors and maintain better mental health (Livingstone & Helsper, 2010; Ribble, 2015).

In the digital era, digital citizenship is shaped not only by individual competencies but also by contextual influences within family and school environments. At the family level, digital parenting practices, such as parental supervision, guidance, communication, and regulation of technology use, significantly influence adolescents' online behavior, ethical awareness, and responsible digital engagement. Similarly, school-level dimensions, including educators' guidance and peer interactions, contribute to the development of digital citizenship by reinforcing digital literacy, social norms, and appropriate online conduct (Ribble, 2015; Kim & Choi, 2018). These contextual influences collectively contribute to adolescents' capacity to navigate digital environments responsibly, safely, and ethically.

The empirical evidence confirming the direct link between digital citizenship skills and mental health outcomes remains scarce, particularly among adolescents (Third et al., 2017). This gap highlights the need to explore how digital citizenship levels correlate with mental health risks and influencing factors. Understanding digital citizenship as a preventive measure and a resilience tool is essential for educators, parents, policymakers, and mental health professionals. Promoting healthy digital engagement can serve as an indicator of potential mental health concerns, enabling early intervention (Livingstone & Helsper, 2010; Ribble, 2015). Therefore, educators can integrate digital citizenship into curricula, parents can support healthy online habits at home, policymakers can shape public health initiatives, and mental health professionals can incorporate these principles into therapy. The culture of digital citizenship is vital for supporting adolescents' mental well-being and development (Obodo et al., 2021; Third et al., 2017; Vickery, 2022).

Building on prior studies and the identified research gaps, this study was guided by two research questions: (i) Which personal, family, and school-related factors are significantly associated with the development of adolescents' digital citizenship as conceptualized in the S.A.F.E. Model? and (ii) How are the four components of digital citizenship, including self-identity, activity online, fluency, and ethics, related to adolescents' mental health? Correspondingly, two hypotheses were formulated: first, personal, family, and school-related factors significantly predict the development of adolescents' digital citizenship as conceptualized in the S.A.F.E. Model, and second, the four components of digital citizenship are significantly associated with adolescents' mental health.

This study aims to identify significant personal, family, and school-related factors influencing the development of digital citizenship and to examine how these distinct components relate to adolescents' mental health. We explored digital citizenship among adolescents in Thailand and examined its relationship with mental health. We used the S.A.F.E. Model to evaluate digital citizenship through four key components: self-identity, online activity, digital environment fluency, and digital ethics. By analyzing these multifaceted dimensions, our research seeks to provide nuanced insights into digital citizenship practices, potentially informing educational strategies and policy development to support responsible technology use among young people (Third et al., 2017).

2. DATA AND METHODS

2.1 Scope of the study

Thailand's education system comprises three types: formal, non-formal, and informal. Formal education, the primary type, includes secondary schools managed by the Office of the Basic Education Commission (OBEC) and vocational schools under the Office of the Vocational Education Commission (VEC). This study focused on secondary students in OBEC and VEC schools in Bangkok, aged 15–18 (Grades 10–12), as this group is highly engaged with digital technologies and social media. Most of the students (97.6%) in 2021 used the internet (National Statistical Office, 2022). Bangkok was selected not only for its high internet access but also for its diverse urban student population in terms of socio-economic background, school type, and access to technological resources, providing an ideal context to examine factors influencing digital citizenship.

2.2 Tools for digital citizenship survey

This study applied Bronfenbrenner's ecological systems theory (1994) to analyze how multiple interconnected systems influence students' development and digital citizenship. This framework offered a comprehensive perspective on how students' environments, ranging from close personal interactions to broader societal influences, shape their development and digital behaviors. The theory identifies five key systems: i) Micro-system: The immediate environment where students directly interact with family, peers, teachers, and school. Bi-directional relationships, such as parent-child or teacher-student dynamics, are crucial. Factors like peer relationships, teaching styles, classroom atmosphere, and digital parenting were central to this study. ii) Meso-system: The connections between micro-systems, such as parent-teacher collaboration, influence a child's education and well-being. The study assessed these relationships using measures such as teacher-guardian interaction scores. iii) Exo-system: External settings indirectly affect students, such as parental work schedules and family living conditions. These factors shape youth behaviors by influencing family dynamics and levels of engagement. iv) Macro-system: The broader cultural, societal, and economic influences, including laws, traditions, and educational policies. The study explored how trends, such as digital culture and societal norms, shape students' beliefs about social media, privacy, and communication. v) Chrono-system: The dimension of time, reflecting life transitions and socio-historical changes. While the study partially applied this concept due to data limitations, it considered key observable transitions and their impact on student development.

In addition, the study incorporated key concepts, including Ribble's nine elements of digital citizenship (Ribble, 2011), the Digital Intelligence (DQ) framework (Kim & Choi, 2018; Park, 2016), ISTE standards (International Society for Technology in Education, 2019), the S.A.F.E. model (Kim & Choi, 2018), and Phornprasert's (2019) adaptation of Ribble (2011) and Park (2016). These frameworks were refined to align with the Thai context, resulting in tailored components and digital citizenship indicators.

2.3 Population and sampling

We applied the Krejcie and Morgan (1970) formula to determine the sample size for the study, with students under OBEC and VEC. There were 106,958 secondary school students in 159 schools under OBEC and 14,968 vocational students in 19 schools under VEC. Thus, we obtained a sample of 759 students, consisting of 384 from secondary schools and 375 from vocational schools (see Table 1, column 3). We visited ten schools in the general education and vocational education streams. The number of each school type was distributed according to the proportion of the students in the sample groups. However, 973 students responded, of whom 469 were under the OBEC and 504 under the VEC (see Table 1, Column 6). The total sample for analysis was still 952, due to missing information. The sample sizes ranged from 82 to 126 students per school (see Figure 1).

Table 1: Population size, sample size, and number of schools

School type	Population size	Expected sample size	Proportion of total sample	Number of schools visited for data collection	Respondents
(1)	(2)	(3)	(4)	(5)	(6)
Secondary school					
Grade 10	33,519				
Grade 11	35,822				
Grade 12	37,617				
Total	106,958 ^a	384	50.0	5	469

Table 1: Population size, sample size, and number of schools (continued)

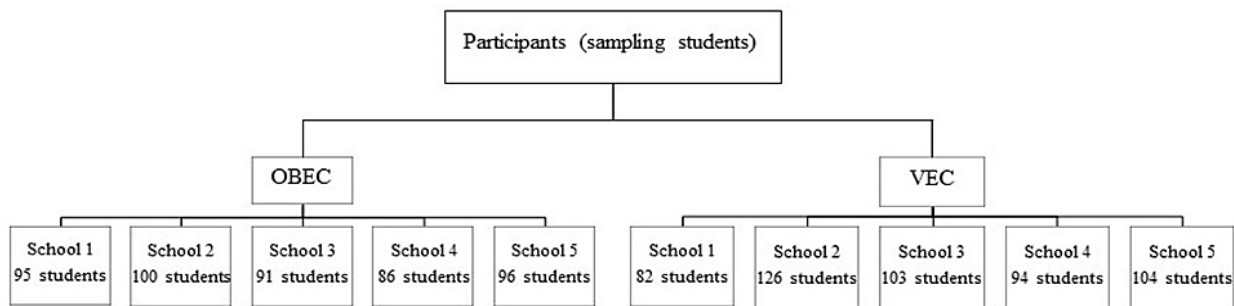
School type	Population size	Expected sample size	Proportion of total sample	Number of schools visited for data collection	Respondents
(1)	(2)	(3)	(4)	(5)	(6)
Vocational school					
Year 1	5,307				
Year 2	4,674				
Year 3	4,987				
Total	14,968 ^b	375	50.0	5	504
Grand total	121,926	759	100.0	10	973

Data source:

^a Geographic Information Division, Strategy and Evaluation Department, Bangkok Metropolitan Administration in 2020.

^b Information Technology and Vocational Manpower Center, Office of the Vocational Education, Ministry of Education in 2022.

Note: Population sizes (Column 2) were obtained from OBEC and VEC records. Expected sample sizes (n; Column 3) were calculated using the Krejcie and Morgan (1970) formula. Percentages (Column 4) represent the proportion of the total expected sample (N = 759), and Column 6 shows the actual respondents.

**Figure 1:** Distribution of participants by school types

2.4 Data collection

Data were collected from January to February 2023 in five OBEC and five VEC schools across Bangkok using purposive sampling. Invitation letters were sent to 10 schools of each type, and positive responses were received from eight OBEC and 10 VEC schools. Due to travel constraints, the five schools with the largest student populations in each category were selected. Teachers randomly selected students available on the visit date. The surveyed schools were located in 8 of Bangkok's 50 districts (see Figure 2), offering diverse student populations across grade levels. After obtaining permission from the school directors, teachers secured parental and student consent prior to data collection and selected secondary and vocational students willing to participate from the classes available that day. Although the study was conducted in Bangkok, the inclusion of schools under both OBEC and VEC systems may provide insights relevant to similar educational contexts in other provinces of Thailand, particularly in urban and semi-urban areas.

2.5 Study instrument

We conducted trial runs of the questionnaires with 124 OBEC secondary school students (grades 10–12) from different schools in the sample to verify the questionnaire's construct validity. Exploratory Factor Analysis (EFA) was conducted to assess the clarity of the questions used to measure digital citizenship and the reliability of the questionnaires. As a result of EFA of 24 items using Principal Component Analysis and the Rotation method (Promax with Kaiser Normalization), the factor rotation converged after 15 iterations. We considered the point at which the eigenvalue exceeds 1 and the elbow of the curve in a scree plot (also known as a screen test), which is helpful when there is a large apparent deviation in the amount of variation explained by the components (Cattell, 1966). However, three sample items (7, 8, and 9) with factor loadings less than 0.50, which were inconsistent with the conceptual analysis of digital citizenship, were eliminated (Hair et al., 2010). Questions with Cronbach's Alpha coefficient of at least .70 were selected, signifying high internal consistency (Zikmund-Fisher et al., 2010) and the quality of the measurement tool (Hair et al., 2010; Taber, 2018). The final questionnaire contains 24 items (Appendix 1).

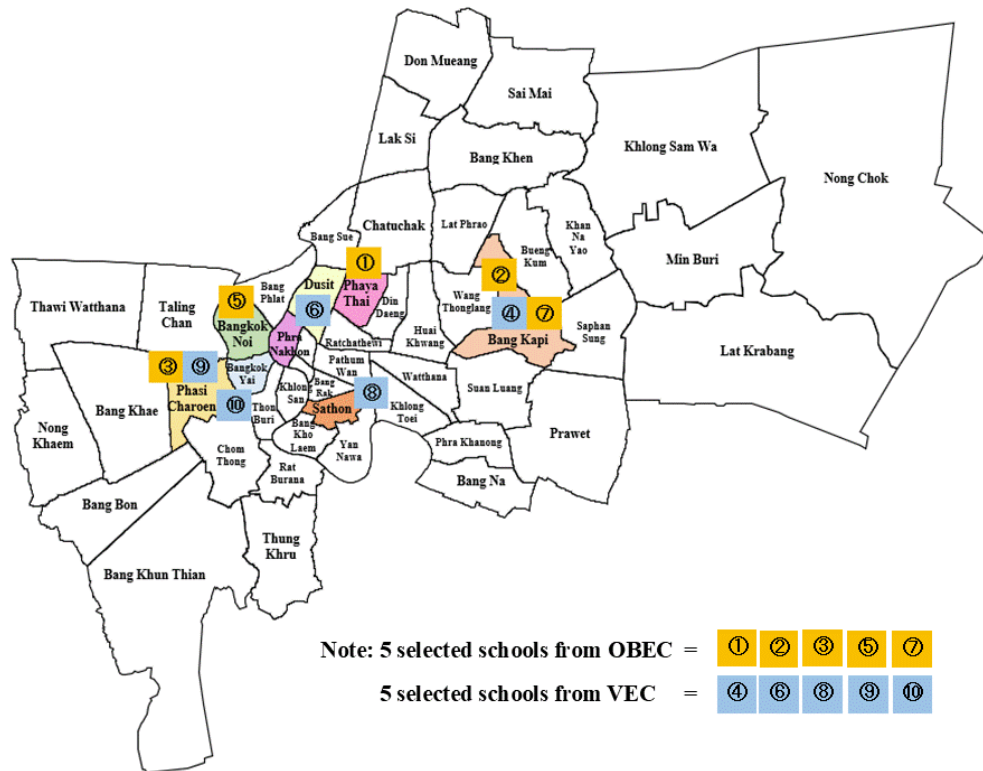


Figure 2: Geographical distribution of selected schools in Bangkok

2.6 Variables and measurement

2.6.1 Dependent variable 1: Digital citizenship (The S.A.F.E. model)

The dependent variable for the first research question was digital citizenship, measured using a 24-item questionnaire adapted from the S.A.F.E. model. The instrument assessed four domains: Self-identity (S), Activity online (A), Fluency in the digital environment (F), and Ethics for the digital environment (E). Each item was rated on a 5-point Likert scale.

2.6.2 Dependent variable 2: Mental health

The dependent variable for the second research question was mental health, measured using the 9-item social functioning scale from the Short Form Health Survey (SF-36), a widely used tool for evaluating Health-Related Quality of Life, which includes a 9-item social functioning scale (Ware & Sherbourne, 1992): (i) Did you feel full of pep? (ii) Have you been a very nervous person? (iii) Have you felt so down in the dumps that nothing could cheer you up? (iv) Have you felt calm and peaceful? (v) Did you have a lot of energy? (vi) Have you felt downhearted and blue? (vii) Did you feel worn out? (viii) Have you been a happy person? (ix) Did you feel tired? Students were asked to indicate how strongly they agreed or disagreed with the items on a 5-point Likert Scale (1 = all of the time, 2 = most of the time, 3 = some of the time, 4 = a little of the time, and 5 = none of the time). The sum score is coded 1 = 23 or less (low), 2 = 24–31 (medium), and 3 = 32–45 (high). Answers to negative questions (i, iv, v, ix) were reversed.

2.6.3 Independent variables

Independent variables include types of school, personal factors, family factors, personal preferences for social communication, and school factors. The definition and measurement of these variables are presented at each level as follows:

2.6.3.1 Types of school

Schools under the Office of the Basic Education Commission (OBEC) and the Office of the Vocational Education Commission (VEC) located in Bangkok (0 = vocational schools; 1 = secondary schools)

2.6.3.2 Personal factors

sex of students (0 = female; 1 = male)

2.6.3.3 Family factors

These include digital parenting scores and living arrangements. The score for digital parenting was derived from six questions in which students were asked to indicate how strongly they agreed or disagreed

with the items on a 5-point Likert Scale (1 = strongly disagree to 5 = strongly agree). The sum score is coded as 1 = 16.9 or less (low), 2 = 17–27.3 (medium), and 3 = 27.4 or over (high). Living arrangements describe with whom students live. The living arrangements vary widely and may impact the student's home life, support system, and overall well-being.

2.6.3.4 Personal preference for social communication

We asked if the students think access to online social media is necessary nowadays. If the answer is yes (939 out of 952), we asked about personal preferences for social communication, including being trendy, privacy, entertainment, and communication. Being trendy refers to being necessary, popular, convenient, and keeping up with the online social world. Privacy refers to the right of individuals to keep their personal information confidential. Entertainment refers to enjoyment, reducing stress, relieving loneliness, and relaxation, in the form of activities such as watching movies, listening to music, or reading books. Communication refers to a channel for connecting with diverse people, communicating more easily, and staying updated on the latest news. The personal preference for social communication section was designed as a multiple-response item; therefore, respondents were allowed to select more than one preference regarding online social communication. Each dimension was analysed independently, and the percentages for each dimension do not sum to 100% because some respondents selected multiple options simultaneously.

2.6.3.5 School factor

The score of friend relationships was measured by six questions, and students were asked to indicate how much they agreed or disagreed with the items on a 5-point Likert Scale (1 = very poor or strongly disagree to 5 = excellent or strongly agree). The sum score is coded into 1 = 16.3 or less (low), 2 = 16.4–24.6 (medium), and 3 = 24.7 or over (high). Four questions were used to measure the score of teaching intensity of technology use. Students were asked to indicate how much they agreed or disagreed with the items on a 5-point Likert Scale (1 = strongly disagree to 5 = strongly agree). The sum score is coded as 1 = 3.3 or less (low), 2 = 3.4–4.6 (medium), and 3 = 4.7 or over (high). The score for classroom atmosphere was measured using five questions, in which students were asked to indicate how strongly they agreed or disagreed with the items on a 5-point Likert Scale (1 = strongly disagree to 5 = strongly agree). The sum score is coded 1 = 11.6 or less (low), 2 = 11.7–17.5 (medium), and 3 = 17.6 or over (high). The score for teacher-guardian relationships was measured using three questions on a 5-point Likert Scale (1 = strongly disagree to 5 = strongly agree). The sum score is coded 1 = 8.8 or less (low), 2 = 8.9–13.6 (medium), and 3 = 13.7 or over (high).

2.7 Statistical analysis

To apply the digital citizenship indicators, SPSS and AMOS were used to assess construct validity through exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). The researchers tested the measurement model based on the hypothetical model developed from observational data and established digital citizenship standards using percentile ranks. Data collected from 952 students were coded and analysed using SPSS. Descriptive statistics were used to summarize participants' demographic characteristics and background variables, showing frequency counts and percentages. Inferential analyses were performed to explore associations between independent variables and outcome measures related to digital citizenship and mental health. Specifically, multiple linear regression analyses were conducted to identify predictors of students' digital citizenship across four domains and of the overall S.A.F.E. composite score. Standardized beta coefficients (β) were reported to indicate the strength and direction of associations, and statistical significance was determined at $p < 0.05$. Adjusted R^2 values were used to assess model explanatory power.

3. RESULTS

3.1 Sample characteristics and digital citizenship

Table 2 presents the sample characteristics and digital parental scores. The respondents are almost equally split, with 48.5% from secondary schools and 51.5% from vocational schools. There were slightly more female students (54.8%) than male students (45.2%). Most of the respondents were 16–17 years old (69%). Most students were in families with medium scores on digital parenting (67.6%). More than half of students lived in families with both parents or extended family (56.7%), and about one-fourth lived with a single parent (24.9%). Regarding personal preferences in social communication, most students (93.7%) believe that access to online social media, particularly for privacy reasons, is not highly necessary. Only 6.3% of the sample disagreed with this view. For school factors, all key elements driving digital citizenship have a medium-level influence on each of the four components: friend relationships, the intensity of technology use in teaching, classroom atmosphere, and teacher and guardian relationships.

Table 2: Demographic characteristics of the adolescents in Bangkok (n = 952)

Independent variable	Category	Number	%
Types of school	General education stream (secondary school)	835	87.7
	Vocational education stream (vocational school)	117	12.3
Personal factors			
Sex	Male	430	45.2
	Female	522	54.8
Age	15	99	10.4
	16	338	35.5
	17	319	33.5
	18	173	18.2
	19	23	2.4
Family factors			
Score of digital parenting (10 points)	Low (less than 16.9)	128	13.5
	Medium (17.0–27.3)	644	67.6
	High (27.4 or over)	180	18.9
Living arrangement	Both parent (s) and extended family	540	56.7
	Single-parent family	237	24.9
	Family with other people	175	18.4
Personal preference for social communication			
Trendy	Yes	126	13.2
Privacy	Yes	60	6.3
Entertainment	Yes	288	30.2
Communication	Yes	314	32.9
School factors			
Score of friend relationships (30 points)	Low (16.3 or less)	161	16.9
	Medium (16.4–24.6)	627	65.8
	High (24.7 or over)	164	17.2
Score of teaching intensity of technology use (25 points)	Low (3.3 or less)	177	18.6
	Medium (3.4–4.6)	466	48.9
	High (4.7 or over)	309	32.5
Score of classroom atmosphere (20 points)	Low (11.6 or less)	107	11.3
	Medium (11.7–17.5)	664	69.7
	High (17.6 or over)	181	19.0
Score of teacher and guardian relationships (15 points)	Low (8.8 or less)	94	9.9
	Medium (8.9–13.6)	665	69.8
	High (13.7 or over)	193	20.3

Note: $N = 952$ Out of 973 initial respondents, 21 were excluded due to missing data. Percentages are calculated based on $N = 952$. For “Personal preference for social communication,” items are multiple-response, with percentages representing affirmative responses (“Yes”) for each category relative to N .

3.2 Mental health

Table 3 describes the mental health status of students in Bangkok, measured using the 36-item Short Form Health Survey (SF-36), a widely used global standard instrument for evaluating Health-Related Quality of Life, which includes a 9-item social functioning scale. Most of the students (68.7%) were classified as having normal mental health, 17.6% were risky/problematic, and 13.7% were rated as having excellent mental health.

Table 3: Mental health status of adolescents in Bangkok (n = 952)

Mental health status	Number	%
Risky/problematic	168	17.6
Normal	654	68.7
Excellent	130	13.7
Total	952	100

Note: Mean (SD) = 30.78; Min–Max = 10–45

3.3 Factors influencing digital citizenship (S.A.F.E. model)

Table 4 presents regression analysis results highlighting significant associations between digital citizenship (S.A.F.E.), school types, and socio-demographic factors. It shows that students in OBEC schools are more likely to have higher overall digital citizenship than their counterparts in VEC schools, significantly affecting all dimensions of the digital citizenship model: self-identity, fluency, and ethics for the digital environment. Male students presented higher proficiency in self-identity and fluency in digital environments than female students. Digital parenting has a substantial impact on all aspects of digital citizenship. The scores reflect parents' ability to guide students in the responsible use of digital devices and to understand the potential benefits of social media. Furthermore, students from both-parent and extended families reported higher levels of digital citizenship ethics in the digital environment than those from families with other people.

Students' motivations for social media use and personal preferences for student communication significantly influenced digital citizenship, including being trendy, privacy, entertainment, and communication. Additionally, being trendy and privacy were strongly linked to all aspects of digital citizenship. Entertainment was linked to both fluency and ethics for digital environments. Communication was strongly linked to self-identity, fluency in the digital environment, and ethics in the digital environment.

School factors were significantly associated with digital citizenship, with key influences on friendships, the intensity of technology use in teaching, and relationships between teachers and guardians. Friend relationships were particularly important in the online activity model. Teaching intensity of technology use, particularly through social media, helps teachers provide faster, more accurate guidance and is a factor driving digital citizenship across all S.A.F.E. dimensions. Teacher-guardian relationships reflect the effectiveness of communication between teachers and parents, positively impacting students' self-identity, online activity, and fluency in the digital environment.

Table 4: Linear regression analysis for factors associated with adolescents' digital citizenship (n = 952)

Characteristics	Standardized coefficients beta				
	Self-identity	Online activity	Fluency in digital environment	Ethics in digital environment	S.A.F.E. (overall)
	(S)	(A)	(F)	(E)	
Types of school (vocational school = ref.)	.129***	0.77**	.100***	.184***	.142***
Personal factors					
- Sex (female = ref.)	.058*	.032	.061*	-.041	.030
- Age	.025	.003	.013	.004	.013
Family factors					
- Digital parenting	.172***	.113***	.124***	.090**	.142***
- Living arrangement (family with other people = ref.)					
▪ Both parent (s) and extended family	.029	.032	.051	.078*	.055
▪ Single parent family	-.060	.034	.026	.027	.007
Personal preference for social communication					
- Trendy	.069*	.073*	.130***	.116***	.112**
- Privacy	.084**	.076**	.098***	.143***	.116***
- Entertainment	.066	.064	.082*	.121***	.096**
- Communication	.099**	.048	.147***	.179***	.139***
School factors					
- Friend relationships	.025	.177***	.037	.000	.062*
- Teaching intensity of technology use	.298***	.307***	.318***	.360***	.366***
- Teacher and guardian relationships	.104**	.107**	.084*	.059	.099**
Constant	24.994	28.401	27.286	34.578	28.815
Adjusted R ²	.334	.342	.300	.351	.416

Note: *** Significant at the 0.001 level, ** Significant at the 0.01 level, * Significant at the 0.05 level

The Pearson correlation was tested. Variables with coefficients greater than 0.7 indicating multicollinearity were dropped between teaching intensity of technology use and classroom atmosphere.

Additionally, due to a Pearson value near 0.7 between classroom atmosphere and teacher-guardian relationships, the classroom atmosphere was removed before running the regression.

3.4 Mental health and digital citizenship

Table 5 shows the impairment of mental health due to excessive internet use, as shown by the negative impacts on each component of the S.A.F.E. model. The “Online activity” component, which contained the highest number of questions related to social responsibility, such as encouraging students to express their opinions online, share their expertise, and participate in online communities focused on social and political issues. These findings indicate that excessive internet use among students was associated with lower digital citizenship scores, which, in turn, reflected poorer mental health. Conversely, female students show a positive association with mental health, indicating that gender influences outcomes. Digital parenting, friend relationships, and teacher and guardian relationships were all found to positively impact mental health. These findings underscore the need for balanced digital use and strong social support systems to support adolescents’ mental well-being in the digital era.

Table 5: Linear regression analysis examining the impact of digital citizenship (S.A.F.E.) on mental health (n = 952)

Digital citizenship (S.A.F.E.)	Mental health	
	Standardized coefficients beta	p-value
Self - identity (S)	-.057	.118
Online activity (A) 0.5 cm	-.074	.044*
Fluency in digital environment (F)	-.057	.105
Ethics in digital environment (E)	-.054	.138
Types of school (vocational school = ref.)	0.29	.365
Personal factors		
- Sex (female = ref.)	.186***	.000
- Age	-.015	.621
Family factors		
- Digital parenting	.234***	.000
- Living arrangement (family with other people = ref.)		
▪ Both parent (s) and extended family	.017	.654
▪ Single parent family	-.020	.588
Personal preference for social communication		
- Trendy	-.024	.498
- Privacy	-.035	.294
- Entertainment	-.038	.324
- Communication	.003	.931
School factors		
- Friend relationships	.169***	.000
- Teaching intensity of technology use	.053	.234
- Teacher and guardian relationships	.083*	.044
Constant	19.842	.000

Note: R = 0.440; R² = 0.194; adjusted R² = 0.182; F = 16.080; Sig. < 0.001.

4. DISCUSSION

In Thailand, online activity has become increasingly prevalent, particularly among children and young people who have grown up in the digital age and are highly proficient in computer technology and wireless internet. On average, computer usage among youth has increased in recent years, with Generation Z (those under 22 years old) being the most frequent internet users. According to the Electronic Transactions Development Agency’s (ETDA) 2021 survey, the Generation Z population spends an average of 12.50 hours online daily. Thai children, particularly secondary school students, spend most of their time on digital platforms such as Facebook, YouTube, and Instagram. Despite their proficiency with digital devices, adolescents and young people often lack real-life experience, limiting their ability to effectively navigate complex uses and fully comprehend the complexities of the digital world. Therefore, developing digital citizenship is essential, as it can improve youth’s digital skills and help them adjust to this rapidly evolving digital society.

This study examined digital citizenship among 952 secondary (OBEC) and vocational (VEC) school students and explored its relationship with mental health. It found that OBEC students scored higher in digital citizenship, while males excelled in self-identity and digital fluency, but lagged in online activity and ethics in digital environment. Family factors, particularly digital parenting, play a significant role in shaping all aspects of digital citizenship. Personal preferences, such as being trendy, privacy, entertainment, and communication, significantly shaped digital citizenship, with “trendy” and “privacy” strongly influencing all aspects of digital

citizenship. School factors that promote digital citizenship and mental health include friend relationships, the intensity of technology use, and teacher-parent collaboration. The findings highlight the need for educational policies that promote digital literacy and responsible online behavior. This includes curriculum adjustments and increased focus on family influences, particularly digital parenting, to reduce excessive internet use and its negative effects on students' mental health.

The higher digital citizenship among OBEC students compared to VEC students may reflect differences in curriculum structure and pedagogical focus. OBEC schools systematically integrate digital literacy across academic subjects, fostering sustained exposure to guided technology use, critical thinking, and ethical engagement. In contrast, vocational education emphasizes practice-based, occupation-specific skills, where digital tools are applied in task-oriented contexts rather than across curricula. Gender differences were also observed: males excelled in self-identity and digital fluency, while females outperformed in online ethics. This may be shaped by Thai socio-cultural norms, where female adolescents are socialized toward self-regulation and interpersonal sensitivity, promoting responsible and ethical online behavior. Additionally, the "Trendy" motivation significantly influenced all dimensions of digital citizenship, reflecting adolescents' psychosocial needs for social validation and peer conformity. Far from being superficial, this drive encourages youth to actively engage with digital platforms, acquiring skills in information evaluation, communication, and ethical conduct to maintain social relevance. Thus, trendiness functions as both a social and developmental mechanism, promoting responsible digital behavior while simultaneously facilitating digital literacy, ethical awareness, and adaptive engagement across multiple aspects of digital citizenship.

The relevance of mental health and digital citizenship is crucial to individual well-being in the digital age, as they influence one another. The findings from this study align with existing research that shows the positive impact of responsible online behavior on mental health (Kuss & Griffiths, 2017; van Deursen & Helsper, 2015). The results suggest that specific digital citizenship initiatives could benefit individuals with mental health challenges in particular. Higher digital citizenship is associated with improved mental health outcomes, such as lower stress, anxiety, and depression, indicating that responsible online behavior is beneficial, while excessive engagement is harmful (Almutairi et al., 2023; Kuss et al., 2013). Digital parenting and strong friend relationships are positively associated with better mental health (Hoferichter et al., 2021; Love & Knott, 2018; Migliorini et al., 2022). Supportive teacher-guardian relationships also contribute to well-being (Sain, 2024; Wijaya et al., 2022). Digital citizenship promotes mental health by enhancing social support, reducing stigma, and improving access to resources, especially for at-risk youth (Choi et al., 2018; Macharia & Dunaway, 2025).

Furthermore, this study found that the intensity of technology use in teaching was significant in digital citizenship among youth, consistent with several reports indicating that teachers develop critical thinking abilities, enhance digital communication skills, and positively impact their communities (Crompton, 2023; Kim & Choi, 2018). Experienced teachers focus on expanding subject knowledge, refining teaching skills, and leading curriculum innovation while guiding students towards independent decision-making and motivation through supportive relationships (Louws et al., 2017).

Meanwhile, parents are often expected to be the primary caregivers and spend the most time with their children, and their relationship is crucial for promoting youth mental health (Cao & Liu, 2023). Parental involvement significantly influences children's well-being and mental health. On the other hand, it might hinder open communication about online experiences, leaving children hesitant to seek help from parents when facing issues. For example, students may inadvertently commit ethical violations online without realizing the impact of digital technology on their physical and mental well-being. Previous research highlights the protective role of parental supervision against risky behaviors, such as physical fighting in the Philippines (Rudatsikira et al., 2008), and the prevalence of bullying among in-school adolescents in Beijing, China (Hazemba et al., 2008). A study in six Asian countries further explores the impact of parental involvement on children's health and well-being in countries like Iraq, Kuwait, Malaysia, Mongolia, the Philippines, and Vietnam, using data from the Global School-Based Student Health Survey (GSHS) (Pengpid & Peltzer, 2016).

Students today can easily access the internet and often demonstrate greater proficiency with digital devices than their parents, accompanied by a growing trend of increased internet usage among adolescents (Beldarrain, 2006; Livingstone & Smith, 2014). This study found that students prioritize social media content related to trends and privacy over entertainment and communication. Importantly, this preference reflects adolescents' psychosocial motivations, particularly their need for social validation and peer conformity, which drive them to actively engage in digital spaces and develop competencies across all dimensions of digital citizenship (Ribble, 2015; Kuss & Griffiths, 2017). While teachers' flexible lesson planning, responsiveness to students' needs, and technological expertise support skill development and independent thinking, the "trendy" drive functions as a social and developmental mechanism, facilitating ethical awareness, digital literacy, and adaptive engagement across multiple aspects of online participation.

5. CONCLUSION

The study revealed a strong correlation between digital citizenship and mental health across all S.A.F.E. model dimensions, with online activity having the most significant impact. This finding highlights the importance of digital literacy and safe online behavior in promoting positive mental well-being. To improve digital citizenship and mental health, schools and parents should collaborate to create supportive environments that teach digital skills, critical thinking, and emotional control. This involves consistent teaching, open communication, and access to mental health support. As technology evolves rapidly, it is essential to continually monitor its impact on youth's mental health and adapt strategies accordingly, recognizing digital citizenship as a lifelong skill. Although excessive internet use harms mental health by negatively affecting each component of the S.A.F.E. model, the model remains a valuable framework for teachers, educators, and parents to enhance digital citizenship education worldwide, particularly among adolescents in Thailand.

DECLARATION

1. Conflict of interest

No potential conflict of interest was reported by the authors.

2. Generative AI and AI-assisted technologies in the writing process

The authors declare that generative AI (ChatGPT-3.5) was used solely for language editing purposes, specifically to check and refine the English in this manuscript. The authors carefully reviewed and approved the final version to ensure its accuracy and integrity.

3. Data availability statement

The data are not publicly available due to ethical restrictions and participant confidentiality but are available from the corresponding author on reasonable request and with permission from the relevant ethics committee.

4. Ethics statement

The study received ethics approval from the relevant institutional review board. All procedures involving human participants complied with institutional and national research ethics guidelines, and informed consent was obtained from the interviewees.

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APPENDIX (ITEMS TO EVALUATE DIGITAL CITIZENSHIP AND THEIR RELIABILITY)

Domain	Digital citizenship evaluation (factor loading)		Cronbach's alpha (α)
	Kim and Choi (2018)	Phornprasert (2019)	
Self-identity (S)	1. Students should be aware of their own health problems caused by the abuse of digital devices, such as addiction and stress. (.747) 2. Students should immediately delete emails from suspicious senders. (.714)	3. Students can carefully protect their own digital information. (.768) 4. Students can access digital data. (.785) 5. Students carefully disclose their personal information online. (.795) 6. Students can tackle cyberbullying. (.726)	0.81
Activity in online (A)	7. Students should express their emotions reasonably when problems or inconveniences arise in the online digital environment. (.447*) 8. Students should express their opinions online and learn and share their expertise. (.489*) 9. Students should purchase legitimate goods during e-commerce activities. (.468*) 10. Students should present their feelings, thoughts, and opinions while posting text, photos, etc. (.763) 11. Students should belong to an online community related to social and political issues. (.746) 12. Students should always check the price on the internet when purchasing goods. (.861) 13. Students should work with others online to solve school or social problems. (.771) 14. Students should take care of the computer immediately if something goes wrong. (.718) 15. Students should be active in Social Network Services such as Line, etc. (.907)	16. Students are minding digital communication with their interlocutors. (.755) 17. Students respect and care about their interlocutors. (.807)	0.76
Fluency for digital environment (F)	18. Students should use digital technology to achieve various goals. (.706) 19. Students should immediately manage unnecessary files and programs on their computers. (.750) 20. Students should use the internet to access more information about domestic and international issues. (.799)	21. Students take part in the use of technology. (.758) 22. Students are aware of opportunities for other people to use technology. (.765) 26. Students avoid diffusing fake information via digital platforms. (.861)	0.84
Ethics for digital environment (E)	23. Students should respect other people in the online environment, e.g., avoiding bullying. (.794) 24. Students should be responsible for their own online activities. (.716) 25. Students should be aware of the order of others in the online digital environment and should obey the order. (.740)	27. Students avoid infringement in digital environments. (.721)	0.91

Note: *These items were removed by factor loading less than 0.4.