Assessment of an Adolescent Digital Citizenship Scale: Examining Dimensionality, Measurement Invariance and External Validity

Evaluación de la Escala Ciudadanía Digital en Adolescentes: Examen de la Dimensionalidad, Invariancia de Medida y Validez Externa

Avaliação da Escala de Cidadania Digital em Adolescentes: Exame da dimensionalidade, invariância de medida e validade externa

青少年数字公民量表的评估：维度性、测量不变性和外部效度的检验

تنقييم مقياس المواطنة الرقمية لدى المراهقين: فحص الأبعاد وثبات القياس والصلاحية الخارجية

Valdés-Cuervo, Angel Alberto [iD]**, Morales-Álvarez, Agustín** [iD]**, Parra-Pérez, Lizeth Guadalupe** [iD]**, & García-Vázquez, Fernanda Inéz** [iD]

Sonora Institute of Technology, México

Abstract

The positive online behavior effects of digital citizenship have increasingly attracted the attention of scholars. This study designed and tested the psychometric properties of an Adolescent Digital Citizenship Scale (DCS-A) in two independent samples of Mexican secondary students (Sample 1, *M* age = 13.2 years, *SD* = 1.5 and Sample 2, *M* age = 13.4 years, *SD* = 1.4; *N*1 = 750, *N*2 = 750). We examined content, factorial, discriminant, concurrent validity, and reliability. We also tested the cross-sample and gender invariance. Confirmatory factor analysis (CFA) demonstrated goodness-of-fit on a second-order factorial model that displays three first-order factors (online ethic, online civic engagement, and online diversity acceptance). Cross-validation confirmed the factorial structure stability of the DCS-A across the independent sample. The result demonstrated the equivalence of the measurement model in both genders (configural, metric, and scalar invariance). The latent means comparison indicates that females held greater online ethics, online civic engagement, and online inclusive behaviors than males. Finally, the concurrent validity of the scale was supported by finding a positive relationship between DCS-A dimensions and defender behavior and a negative association with passive and reinforces interventions in cyberbullying events. These results suggest that the DCS-A is a theoretically and psychometrically grounded measure of digital citizenship in adolescents.

Keywords: Digital citizenship, adolescence, measurement, validity, reliability.

Resumen

Los efectos de la ciudadanía digital sobre la conducta en línea atraen la atención de investigadores. Se han evaluado las propiedades psicométricas de la Escala de Ciudadanía Digital en Adolescentes (DCS-A) en dos muestras independientes de estudiantes mexicanos de secundaria (Muestra 1 *M* edad = 13.2 años, *DE* = 1.5 y Muestra 2 *M* edad = 13.4 años, DE = 1.4; N1 = 750, N2 = 750) hallando evidencias de validez de contenido, validez factorial, validez discriminante, validez concurrente y fiabilidad. Asimismo, se evaluó la invariancia de medida del modelo en ambos sexos y se realizó una validación cruzada del modelo confirmando la estabilidad de la DCS-A en una muestra independiente. El análisis factorial confirmatorio reveló el ajuste a los datos de un modelo de segundo orden que contiene tres factores de primer orden (ética, compromiso cívico y aceptación de la diversidad en línea). Los resultados demuestran la equivalencia del modelo de medición en ambos sexos (invariancia configural, métrica y escalar). La comparación de medias latentes indicó que las adolescentes poseen mayores conductas éticas, compromiso cívico y de aceptación de la diversidad en línea con respecto a los adolescentes. La validez concurrente de la escala DCS-A fue confirmada por el hallazgo de que las dimensiones de la DCS-A están relacionadas positivamente con la intervención defensiva y negativamente con la intervención pasiva y alentadora de los espectadores en las situaciones de ciberbullying. Los resultados sugieren que la DCS-A es una medida teórica y psicométricamente robusta de la ciudadanía digital en adolescentes.

Palabras clave: Ciudadanía digital, adolescencia, medición, validez, fiabilidad.

Corresponding author / Autor de contacto: Angel Alberto Valdés-Cuervo, Departamento de Educación. Instituto Tecnológico de Sonora, México. Calle 5 de febrero 818, C.P. 85000, Centro, Ciudad Obregón, Sonora, México; correo-e: avaldes.itson@gmail.com

Resumo

Os efeitos da cidadania digital no comportamento online atraem a atenção de investigadores. As propriedades psicométricas da Escala de Cidadania Digital em Adolescentes (DCS-A) foram avaliadas em duas amostras independentes de estudantes mexicanos do ensino secundário (Amostra 1 *M idade* = 13,2 anos, *DE* = 1,5 e Amostra 2 *M idade* = 13,4 anos, *SD* = 1,4; *N1*= 750, *N2*= 750), encontrando evidências de validade de conteúdo, validade fatorial, validade discriminante, validade concorrente e fiabilidade. Além disso, a invariância de medida do modelo foi avaliada em ambos os sexos e foi efetuada uma validação cruzada do modelo, confirmando a estabilidade da DCS-A numa amostra independente. A análise fatorial confirmatória revelou a adequação aos dados de um modelo de segunda ordem que contém três fatores de primeira ordem (ética, compromisso cívico e aceitação da diversidade online). Os resultados demonstram a equivalência do modelo de medição em ambos os sexos (invariância configural, métrica e escalar). A comparação de médias latentes indicou que as adolescentes têm comportamentos éticos, compromisso cívico e aceitação da diversidade online mais elevados do que os adolescentes. A validade concorrente da escala DCS-A foi confirmada pela constatação de que as dimensões da DCS-A estão relacionadas positivamente com a intervenção defensiva e negativamente com a intervenção passiva e encorajadora dos espetadores nas situações de ciberbullying. Os resultados sugerem que a DCS-A é uma medida teórica e psicometricamente robusta da cidadania digital em adolescentes.

Palavras-chave: Cidadania digital, adolescência, medição, validade, fiabilidade

摘要

数字公民身份对在线行为的影响引起了研究人员的关注。我们在两组独立的墨西哥中学生样本中评估了青少年数字公民量表（DCS-A）的心理测量特性（样本 1：平均年龄 13.2 岁，标准差 1.5；样本 2：平均年龄 13.4 岁，标准差 1.4；N1 = 750，N2 = 750），并找到了内容效度、结构效度、辨别效度、同时效度和信度的证据。此外，还评估了模型在两性中的测量不变性，并对模型进行了交叉验证，确认 DCS-A 在独立样本中的稳定性。验证性因素分析揭示了一个包含三个一阶因素（伦理、公民参与和在线多样性接受）的二阶模型的数据拟合情况。结果证明了测量模型在两性中的等效性（配置不变性、度量不变性和量表不变性）。潜在均值的比较表明，女性青少年的伦理行为、公民参与和在线多样性接受行为高于男性青少年。DCS-A量表的同时效度通过发现DCS-A 的各维度与网络欺凌情境中的防御性干预呈正相关，与被动和鼓励性干预呈负相关而得到证实。结果表明，DCS-A 是衡量青少年数字公民身份的理论和心理测量上稳健的工具。

关键词：数字公民、青春期、测量、有效性、可靠性

ملخص

إن تأثيرات المواطنة الرقمية على السلوك عبر الإنترنت تجذب انتباه الباحثين. تم تقييم الخصائص السيكومترية لمقياس المواطنة الرقمية لدى المراهقين (DCS-A) في عينتين مستقلتين من طلاب المدارس الثانوية المكسيكية (العينة M 1 العمر = 13.2 سنة،*DE* = 1.5 والعينة M 2 العمر = 13.4 سنة، SD = 1.4؛ N1 = 740، N2 = 750)، وتم العثور على دليل على صحة المحتوى وصلاحية العناصر وصلاحية التمييز وصلاحية التزامن والموثوقية. وبالمثل، تم تقييم ثبات قياس النموذج في كلا الجنسين وتم إجراء التحقق من صحة النموذج مما يؤكد استقرار DCS-A في عينة مستقلة. كشف التحليل العاملي التأكيدي عن ملاءمته لبيانات نموذج من الدرجة الثانية يحتوي على ثلاثة عوامل من الدرجة الأولى (الأخلاق، والمشاركة المدنية، وقبول التنوع عبر الإنترنت). وأظهرت النتائج تكافؤ نموذج القياس في كلا الجنسين (الثبات الشكلي والمتري والعددي). أشارت مقارنة الوسائل الكامنة إلى أن الفتيات المراهقات لديهن سلوكيات أخلاقية والتزام مدني وقبول للتنوع عبر الإنترنت أكبر مقارنة بالمراهقين. تم تأكيد الصلاحية المتزامنة لمقياس DCS-A من خلال اكتشاف أن أبعاد DCS-A ترتبط بشكل إيجابي بالتدخل الدفاعي وترتبط سلباً بالتدخل السلبي والمشجع للمارة في مواقف التسلط عبر الإنترنت. تشير النتائج إلى أن DCS-A هو مقياس قوي من الناحية النظرية والنفسية للمواطنة الرقمية لدى المراهقين.

الكلمات الدالة: المواطنة الرقمية، المراهقة، القياس، الصلاحية، الموثوقية

Introduction

The Internet has reached a high penetration within the adolescent population in the last decades. Recent studies report that most of 70% of the world's population of adolescents are Internet users (International Telecommunication Union [ITU], 2021; Organization for Economic Cooperation and Development [OECD], 2020). The internet-based activities influence adolescents' perspectives on the self, others, and their community. Although the Internet has brought learning and socialization opportunities (Areepattamannil & Khine, 2017; Coyne et al., 2014), it also poses substantial risks for adolescents. Internet use is currently one of the most concerning issues among youth because it is associated with internet addiction, health disorders, and cyberbullying (Anderson et al., 2017; Garaigordobil & Larrain, 2020; Reiner et al., 2017; Wachs et al., 2019). Scholars explain that these negative phenomena are stimulated in online environments as youths have less social control, which provides opportunities for the transgression of civic, moral, and social norms (Lee et al., 2016; Notten & Nikken, 2016). Given the Internet's influence on youth socialization, there is a need to educate adolescents about behaving responsibly online (Choi et al., 2017; Kim & Han, 2020; United Nations Educational Scientific and Cultural Organization [Unesco], 2020).

Digital literacy has previously been brought forward as a solution to the harmful effects of the internet on the most vulnerable population: adolescents and youths. Digital literacy promotes internet-based skills such as creating and sharing information, using privacy settings, and performing identity protection behaviors (Almerich et al., 2021; Hernández-Martín et al., 2021; Lau & Yuen, 2014). Although digital literacy remains an essential component of adolescent online behavior, current research underlines the need to promote other behaviors related to digital citizenship that encourage individuals to participate in online environments positively, critically, and socially (Choi, 2016; Kim &

Choi, 2018; Jones & Michell, 2016; Ribble, 2015; Subrahmanyam & Smahel, 2011). Digital citizenship should be differentiated from simple digital literacy education and problematic internet use prevention because it seeks to educate individuals to use such skills positively and critically online. Thus, research on digital citizenship is a crucial starting point for adolescents' prosocial online socialization, which has encouraged online opportunities and hindered online risks.

Digital Citizenship

Citizenship is essential for raising individuals to be active and productive members of society. Scholars agree that an essential aspect of citizenship is to move beyond self-interest to the commitment to the well-being of others (Sherrod et al., 2002; Choi, 2016). Similarly, digital citizenship leads individuals to be functional in online environments by internalizing the rights and responsibilities of others and their communities in the online setting. Even though current definitions of digital citizenship vary throughout the literature (e.g., Choi, 2016; Heath, 2018), all these definitions include respectful online relationships with others and support for one's community as critical traits of individuals. As digital citizens, individuals are expected to go from self-interest for personal safety and well-being to supporting positive behaviors to achieve well-being for individuals and larger groups. These prosocial behaviors have been documented throughout the literature. Some studies (Claravall & Evans-Amalu, 2020; Harrison & Polizzi, 2022; Mueller et al., 2011) have consistently reported a positive association between digital citizenship and psychological resources such as empathy and self-regulation. Likewise, digital citizenships reduce problematic online behaviors have been found, such as cyberbullying, hate speech, and hacking (Castaño-Pulgarín et al., 2021; Kim & Han, 2020; Marcum et al., 2014; Zhu et al., 2021).

Then, the educational effort can be focused on encouraging personal and socially responsible internet uses in adolescents.

Encouraging digital citizenship through these dimensions remains critical for developing online prosocial behaviors in adolescents. Online ethical behaviors reflect an adolescent concern and respect for other people's or groups' beliefs and worldviews in online interactions. Online civic engagement refers to individual actions (such as sharing information and skills with community members, volunteering, and supporting charities) to enhance the community or well-being of its members (Choi et al., 2017; Dedebali & Dasdemir, 2019; Jones & Michell, 2016). On the other hand, online diversity acceptance implies that adolescents accept and maintain positive relationships with people with differences, such as cultural backgrounds, socioeconomic status, and sexual orientation (Kim & Han, 2020; Unesco, 2020). The development of acceptance is based upon our capacity to accept that people with different beliefs and customs should be treated equally and respectfully. These three dimensions of digital citizenship are development tasks because they are considered critical to adolescent well-being and functioning democracy (Guasp-Coll et al., 2021; Jugert et al., 2013).

Educational actions could facilitate these digital citizenship dimensions by promoting assertive conflict resolution, moral character, training interpersonal competencies, self-confidence, and mature identity (Crocetti et al., 2014; Jugert et al., 2013). Then, evaluating these interventions and the consequences of digital citizenship requires theoretically and psychometrically grounded scales.

Measures of Digital Citizenship

A growing interest in the construct has led several scholars (see Al-Zahrani, 2015; Choi et al., 2017; Isman & Gungoren, 2014; Kara, 2018; Kim & Choi, 2018; Nordin et al., 2016) to develop different scales aimed to measure digital citizenship. However, most of these scales target adults, especially college students, and teachers; both populations are typically more detached from internet misuse than adolescents. Moreover, most current scales (Al-Zahrani, 2015; Isman & Gungoren, 2014; Kara, 2018; Nordin et al., 2016) measure some dimensions of digital citizenship, such as digital literacy, safety, and etiquette, but leave aside significant other prosocial-leading dimensions such as ethics, civic engagement, and diversity acceptance.

To our knowledge, only two scales attempt to assess digital citizenship using prosocial-leading behaviors such as ethics, civic engagement, and diversity acceptance; however, they need to consider these factors jointly. The Digital Citizenship Behavior Scale (DCBS; Jones & Michell, 2016) is a multidimensional scale to assess US adolescents' online respect and civic engagement. On the other hand, the Multicultural Acceptability Scale (Kim & Han, 2020) was designed to measure multicultural acceptance in Korean adolescents. Whereas current scales aim to measure online behaviors of Asian, European, and US adolescent populations, we believe that some indicators and evolving patterns of digital citizenship may vary across Latin-American cultures. Even though both scales assess prosocial-leading behaviors such as ethics, civic engagement, and diversity acceptance while measuring digital citizenship, they do not do so comprehensively.

Unlike previous research, we sought to develop a scale to measure digital citizenship that involves prosocial-leading factors that include ethics, civic engagement, and diversity acceptance and then were examined concurrently. The scale development process was guided by conceptualizing digital citizenship dimensions proposed in the past and emerging literature (see Curran & Ribble, 2017; Jones & Michell, 2016; Kim & Han, 2020). The goal was to design a theoretically and psychometrically grounded scale to assess digital citizenship that captures adolescent ethics, civic engagement, and diversity acceptance.

Gender Differences in Digital Citizenship

In addition to being limited, empirical evidence regarding gender behavior in online environments remains inconclusive. While some studies report higher levels of digital citizenship in males (Lyons, 2012; Martin et al., 2020), others (Jones & Mitchell, 2016) found higher levels in females. Nonetheless, all of these results should be taken with caution since it is unclear if the results are due to actual differences in these groups or differences in the structure of the measurement (Putnick & Bornstein, 2016). Thus, there is a need to examine whether the DCS-A is a comparable measure across gender; this condition would bring better certainty while exploring differences within these populations (Brown, 2015; Putnick & Bornstein, 2016). Measurement invariance is necessary for a meaningful comparison of digital citizenship between genders, which could be used to predict online behaviors better.

Relationships with External Variables

Scholars define cyberbullying as repetitive and intentional interpersonal aggressive behaviors perpetrated via technology to hurt the victim (Hinduja & Patchin, 2008; Tokunaga, 2010). Bystander intervention is essential in explaining differences in cyberbullying rates and their effects on victims (Balakrishnan, 2018; Zych et al., 2019). The literature consistently reports that bystanders may adopt three stances: outsiders, reinforcing the aggression, or defending the victims (Machackova et al., 2018; Sarmiento et al., 2019). While outsider or reinforcing interventions were positively associated with cyberbullying and harmful consequences for the victims, defender interventions may hinder cyber aggression and attenuate its negative effect on victims (DeSmet et al., 2019; Holfeld, 2014; Torgal et al., 2021). Understanding what leads bystanders to intervene remains critical to explaining differences in school cyberbullying (Bauman et al., 2020; Lambe et al., 2019; Patterson et al., 2017).

Empirical research is scarce in exploring the relationship between online ethics, online civic engagement, and online diversity acceptance with adolescent non-prosocial and prosocial online behaviors. However, available studies (Choi et al., 2017; Jones & Mitchell, 2016; Kim & Choi, 2018; Kim & Han, 2020; Vlaanderen et al., 2020; Zhong et al., 2021) consistently report positive effects of these digital citizenship dimensions on adolescent online behavior. For example, previous research (Jones & Mitchell, 2016; Vlaanderen et al., 2020) suggests that digital citizenship led bystanders to adopt a defensive intervention. Thus, concurrent validity was tested by examining the association between digital citizenship and types of bystander intervention in cyberbullying events.

The Present Study

Previous studies have confirmed that digital citizenship promotes prosocial behaviors towards others and the community. Furthermore, three critical gaps in the measurement of digital citizenship in adolescents need to be attended to. First, previous studies did not examine the goodness-of-fit of a second-order factor measurement model that includes ethics, civic engagement, and diversity acceptance aspects of digital citizenship. Second, no studies known by the authors explored measurement invariance of the model with significant variables, such as gender. Third, studies about the external validity of measures of digital citizenship still need to be expanded. Moreover, current studies have not yet examined the psychometric properties of a scale to measure digital citizenship that includes dimensions considered in our measurement model in Latin American adolescents. Under this context, the present study developed and tested a multidimensional digital citizenship measurement model in adolescents using two independent samples. The discriminant validity of each DCS-A subscale was examined. Then, the measurement invariance by gender was analyzed. Later, the latent variable means across gender were compared only when a scalar measurement invariance

was confirmed. The concurrent validity of the scale was tested by analyzing its relationships with styles of bystander intervention in cyberbullying events.

Several hypotheses were explored to accomplish these purposes. Hypothesis 1 (internal structure): The three first-order factors will display a one-dimensional second-order with fit to the data. Hypothesis 2 (cross-validity): The measure's properties factor model derived from the calibration sample (Sample 1) is replicated in a cross-validation sample (Sample 2). Hypothesis 3 (discriminant validity): Each subscale of DCA-A measures a unique construct. Hypothesis 4 (reliability): Scores have acceptable reliability (composite reliability and average variance extracted). Hypothesis 5 (measurement invariance): The scale is an equivalent measure by gender. Hypothesis 6 (means comparisons): Gender differences hypotheses were not considered due to the contradictory results in the previous literature. Hypothesis 7 (concurrent validity): Online ethics, online civic engagement, and online diversity acceptance behaviors are positively associated with bystander defender intervention in cyberbullying events and negatively with bystanders being outsiders or reinforcing bullying intervention.

Method

Participants

Participants came from 25 public urban secondary schools in Sonora and 25 from Sinaloa, Mexico. The public urban Mexican secondary schools include students with various socioeconomic statuses, mainly lower and middle-class students (National Institute for Education Evaluation [INEE], 2019). Sample 1 (calibration sample) included 750 adolescents (30 of each school) of Sonora (48% girls and 52% boys), with ages from 12 to 15 years old (M age = 13.2 years, SD = 1.5). Sample 2 (cross-validation sample) included 750 (30 for each school) adolescents of Sinaloa (49% girls and 51% boys) adolescents ranging between 12 and 16 years old (M age = 13.4 years, SD = 1.4). 43% attended first secondary grade, 37% second, and 30% third.

Measures

Digital Citizenship Behavior in Adolescents

The Adolescent Digital Citizenship Scale (DCS-A) was developed for the study. Seven items were brought from the Digital Citizenship Behaviors Scale (Jones & Michell, 2016), and one additional item was brought from the Multicultural Acceptance Scale (Kim & Han, 2020). From the results of working with two focus groups, 15 additional items were added, which were grouped into the three targeted dimensions of digital citizenship (ethics, civic engagement, and diversity acceptance) according to their content.

During item development, we conducted two focus group interviews that included 12 Mexican students (6 males and 6 females) from six high schools (four for first, second, and third grade) who voluntarily agreed to participate. During focus group sessions, we defined digital citizenship with student participants as "a responsible online behavior that involves ethics, civic engagement, and diversity acceptance." Then, students shared their thoughts and experiences based on two overarching questions: (a) How would you define ethical behavior, civic engagement, and diversity acceptance practices? (b) What digital behaviors do you practice online that indicate ethical civic engagement and inclusive practices?

Then four researchers with expertise in digital citizenship were brought in to assess the relevance of each of the 23 items on a 4-point scale ranging from 1 = *not relevant* to 4 = *very relevant*). Items with good content-related validity (Content validity index ICV ≥ .78; Polit et al., 2007; Wynd et al., 2003) were retained for the final version of 21 items in the DCS-A (see Table 1). This set of items was used to conduct the present study. Items are indicators of digital citizenship, *online ethics* (7 items, e.g., "When posting or sending pictures of others, I take care to do not to embarrass them or get them into trouble."), *online civic engagement* (7 items, e.g., "I have used the internet to advocate for charity activities that support disadvantaged

people in my community."), and *online diversity acceptance* (7 items, e.g., "I am involved in social networks with people from different cultural backgrounds."). Response options used a 5-point Likert format ranging from 0 = *Never* to 4 = *Every time*.

Bystander Intervention in Cyberbullying

Bystander intervention in cyberbullying was measured using three subscales from the Cyberbullying Bystander Scale (CBS; Sarmiento et al., 2019). The scale comprises 18 items in Likert-type format (0 = *Never* to 4 = *Very Frequently*) to statements beginning with the sentence "In the last 12 months, how did you respond online to a peer who was cyberbullying?" Items were grouped into three dimensions: (a) *Outsider* (5 items, e.g., "I see on the internet and social networks how some people upload photos or videos that harm others; however, I say nothing to defend them" (composite reliability CR = .88, average variance extracted AVE = .59), (b) *Defender of cyber victims online* (6 items, e.g., "When I am on social media, and I see that some people harass others who cannot defend themselves, I tell them not to do it," (CR = .90, AVE = .63), and (c) *Reinforce of the cyberbully online* (7 items, e.g., "When interacting in social networks on the internet, I see people who harass others and let them know that I find it funny," CR = .89, AVE = .64). The confirmatory factorial analysis (CFA) indicated the model fit to the data (SBX^2 = 38.68, *df* = 25, *p* = .041; SRMR = .04; CFI = .99; TLI = .98; RMSEA = .033, 90% CI [.02, .05]).

Procedure

Data was collected in classrooms during school hours in January and February of 2022. The researchers obtained approbation from the Ethical Committee of the Technological Institute of Sonora (Number 2022_0003). Parents signed a consent letter to allow their children to respond to the questionnaires. Only 6% of parents did not allow their children to participate. We reminded adolescents that participation was voluntary and that they could withdraw from the study.

Data Analyses

The missing data in all variables were less than 5%. They were treated with multiple imputation procedures available in *SPSS 26*. Descriptive item examinations (mean, median, standard deviations, skew, and kurtosis) were calculated using the *SPSS 26* software. A robust maximum likelihood estimator (MLR) was performed to estimate CFA using *Mplus 8* software. To examine univariate normality, we used a test based on the skewness and kurtosis values (Ho, 2006). The statistical *Z* value is calculated as Z skewness = skewness/√se skewness and *Z* kurtosis = kurtosis/√se kurtosis. If *the Z* value exceeds +-3.09, the normality assumption at the .001 critical probability level is rejected.

To meet our research objectives, we performed the next steps. First, we examined the fit of a three-dimensional first-order factors model with all factors intercorrelated. After confirming the fit of this model, we modeled these three first-order factors as latent indicators of the second-order factor model of digital citizenship dimensions. Then, we tested the goodness-of-fit using the Satorra-Bentler statistic (SBX^2 with *p* > .001), standardized root means the square error of approximation (SRMR < .08), comparative fit index (CFI ≥ .95), Tucker-Lewis index (TLI ≥ .90), and root mean square error of approximation (RMSEA < .08) (Brown, 2015; Byrne, 2012). We compared the goodness-of-fit of first-order and second-order factor models using differences in SBX^2 and Bayesian information criterion (BIC). Structural equation modeling literature (SEM) posits that when differences in the (ΔSBX^2, *p* < .001) are significant; a model with less SBX^2 has a better adjustment. Additionally, we compared models fit using differences in BIC (ΔBIC). ΔBIC > 10 indicates differences in the model's fit to the data, a model with less BIC has a better fit. If these criteria disagree, we relied on BIC differences because SBX^2 statistic is sensitive to sample size (Byrne, 2012; Muthén & Muthén, 2017).

Sample Cross-Validation

Measurement model stability in an independent sample was examined using a multigroup approach (Byrne, 2012). Based on the literature, we tested: (a) configural invariance (the number of constructs and the observed variables associated with each construct is the same across samples), (b) metric invariance (constrained factor loadings are equal across samples), and (c) scalar invariance (constrained measurement intercept is equal across samples). When a difference in the SBX^2 is larger than the critical p-value ($p < .001$), constraints are not equivalent across groups (Brown, 2015; Putnick & Bornstein, 2016). However, since the ΔSBX^2 statistic is sensitive to larger sample sizes, it is advocated to use goodness-of-fit indexes, such as ΔCFI and $\Delta RMSEA$ (Cheung & Rensvold, 2002; Byrne, 2012). This study additionally utilized the difference in CFI (ΔCFI), which should be less than .01, and differences in RMSEA ($\Delta RMSEA$), which should be less than .015. If the results of these procedures differed, we trusted the changes in CFI and RMSEA based on the structural modeling literature (SEM) recommendations (Cheung & Rensvold, 2002; Putnick & Bornstein, 2016).

Discriminant Validity

The discriminant validity of each subscale (online ethics, online civic engagement, and online diversity acceptance behaviors) demonstrated that the latent constructs are genuinely distinct. Based on the literature, we assumed that discriminant validity is confirmed if the square correlation between scales is less than the average variance extracted from each scale (Fornell & Lacker, 1981; Hair et al., 2010).

Reliability

Reliability was tested using composite reliability (CR) and average variance extracted (AVE). Based on the guidance from the literature, we considered CR ≥ .70 and AVE ≥ .50 to indicate acceptable reliability (Hair et al., 2017; Peterson & Kim, 2013).

Measurement Invariance by Gender

Measurement invariance by gender was examined by using a multigroup approach. The invariance of several nested models was tested: configural, metric, and scalar. Invariance was confirmed when the value of SBX2 was larger than the critical value (SBX2 with $p < .001$), the difference in CFI (ΔCFI) was less than .01, and differences in RMSEA ($\Delta RMSEA$) less than .015 (Cheung & Rensvold, 2002; Putnick & Bornstein, 2016).

Latent Means Comparison

If scalar invariance was confirmed, latent mean differences were tested by gender. The reference group (males) factor means were set to zero, while group factor means for females were estimated freely. A z statistic was used to calculate the differences (Byrne, 2012).

Concurrent Validity

The correlation between digital citizenship dimensions and styles of bystander intervention (outsider, reinforce, or defender) in cyberbullying events was calculated using Spearman's correlation coefficient. Based on Funder and Ozer's (2019) guidelines, an *r* of .10 suggests a small, *r* of .20 medium, and *r* of .30 a large effect size.

Results

Descriptive Analysis

We found that some items depart from univariate normality. However, skew and kurtosis values are less than 2 and 7, respectively, which indicates that it is very unlike that there is a significant distortion in the data (Bandalos & Finney, 2019). Additionally, we used in the model evaluation a robust procedure (Satorra-Bentler corrections) unaffected by normality departures (Byrne, 2012; Mueller & Hancock, 2019). Values of means and medians indicate that two sample items are centered in the "sometimes" category or the "almost every time" category, suggesting that adolescents occasionally display digital citizenship behaviors (see Table 1).

Table 1. Descriptive Analysis of DCS-A Items in Sample 1 and Sample 2

Item	Sample 1							Sample 2						
	M	Md	SD	Skew	Z_{skew}	Kurt	Z_{kurt}	M	Md	SD	Skew	Z_{skew}	Kurt	Z_{kurt}
1	2.63	3	1.55	-0.68 (.15)	1.78	-1.11 (.21)	2.41	2.83	3	1.26	-0.89 (.17)	2.17	-0.18 (.23)	0.38
2	2.94	3	1.54	-1.13 (.15)	2.97	- 0.41 (.21)	0.89	3.14	3	1.17	-1.34 (.17)	3.26***	0.92 (.23)	1.95
3	2.84	3	1.33	-1.02 (.15)	2.68	-0.17 (.21)	0.36	2.79	3	1.18	-0.75 (.17)	1.82	-1.25 (.23)	2.65
4	2.81	3	1.52	-0.89 (.15)	2.34	-0.72 (.21)	1.56	3.07	3	1.17	-1.24 (.17)	3.02	0.72 (.23)	1.53
5	1.58	2	1.22	0.43 (.15)	1.13	-1.57 (.21)	3.41***	1.88	2	1.59	0.08 (.17)	0.19	-1.57 (.23)	3.34***
6	2.93	3	1.46	-1.09 (.15)	2.86	-0.29 (.21)	0.63	3.07	3	1.09	-1.12 (.17)	2.73	0.65 (.23)	1.38
7	2.59	3	1.51	0.65 (.15)	1.71	-1.04 (.21)	2.26	3.01	3	1.17	-1.07 (.17)	2.61	0.36 (.23)	0.76
8	1.47	1	1.32	0.43 (.15)	1.13	-1.13 (.21)	2.45	2.12	2	1.37	-0.15 (.17)	0.36	-1.16 (.23)	2.46
9	1.90	2	1.46	0.05 (.15)	0.13	-1.32 (.21)	2.86	2.08	2	1.21	-0.49 (.17)	1.19	-0.48 (.23)	1.02
10	2.05	2	1.52	-0.07 (.15)	0.18	-1.48 (.21)	3.21***	2.19	2	1.35	-0.21 (.17)	0.51	-1.08 (.23)	2.29
11	1.85	2	1.52	0.11 (.15)	0.28	-1.40 (.21)	3.04	2.01	2	1.37	-0.18 (.17)	0.43	-1.02 (.23)	2.17
12	1.93	2	1.64	0.16 (.15)	0.42	-1.26 (.21)	2.73	1.84	2	1.56	0.22 (.17)	0.53	-1.16 (.23)	2.46
13	2.09	2	1.33	-0.22 (.15)	0.57	-1.11 (.21)	2.41	1.92	2	1.67	-0.34 (.17)	0.82	-1.41 (.23)	3.00
14	1.78	2	1.42	-0.36 (.15)	0.94	-1.32 (.21)	2.86	1.79	2	1.29	-0.56 (.17)	1.36	-1.12 (.23)	2.38
15	2.53	2	1.11	-0.92 (.15)	2.42	-.06 (.21)	0.13	1.66	2	2.33	-1.02 (.17)	2.48	0.81 (.23)	1.72
16	2.49	2	1.84	0.43 (.15)	1.13	-1.21 (.21)	2.63	2.62	3	1.15	-0.39 (.17)	0.95	-1.17 (.23)	2.48
17	2.86	3	0.97	-1.13 (.15)	2.97	-1.63 (.21)	3.54***	3.02	3	1.81	-0.65 (.17)	1.58	-1.58 (.23)	3.36
18	2.87	3	1.83	-0.76 (.15)	2.00	-1.45 (.21)	3.15***	2.82	3	2.11	-0.85 (.17)	2.07	-1.15 (.23)	2.44
19	3.22	3	1.66	1.09 (.15)	2.86	-1.73 (.21)	3.76***	3.12	3	1.43	-1.04 (.17)	2.53	1.19 (.23)	2.53
20	2.74	3	1.73	0.65 (.15)	1.71	-0.59 (.21)	1.28	2.98	3	1.29	-0.88 (.17)	2.14	0.93 (.23)	1.97
21	3.47	3	1.21	0.39 (.15)	1.02	-0.82 (.21)	1.78	3.54	3	1.09	-0.43 (.17)	1.04	0.52 (.23)	1.11

Note. Skew and kurtosis standard deviation are reported in parenthesis.

Assessing Dimensionality

Sample 1 (Model calibration N = 750)

Confirmatory factor analysis (CFA) suggests that a three-first-order factor model (Model A) has an acceptable goodness-of-fit to the data (SBX^2 = 102.46, *df* = 46, *p* < .001; SRMR = .07; CFI = .94; TLI = .92; RMSEA = .06, 90% CI [.04, .08], BIC = 150.21). The literature suggests modification indexes above five indicate model misfit areas (Brown, 2015; Byrne, 2012). Based on this result, we modified the model by adding covariance between items 3 and 6. These changes improved the fit of the measurement model (SBX^2 = 64.09, *df* = 42, *p* = .015; SRMR = .05; CFI = .97; TLI = .96; RMSEA = .043, 90% CI [.022, .061]; BIC = 132.02). All the factor loadings are statistically significant (*p* < .001) (see Figure 1). The correlation between three factors is statistically significant: ethics with civic engagement (*r* = .47, *p* < .001), ethics with diversity acceptance (*r* = .54, *p* < .001), and civic engagement with diversity acceptance (*r* = .52, *p* < .001). The correlations' values suggest a second-order model is possible (Byrne, 2012).

Figure 1. Three First-Order Factor Model of Adolescents' Digital Citizenship Behaviors.
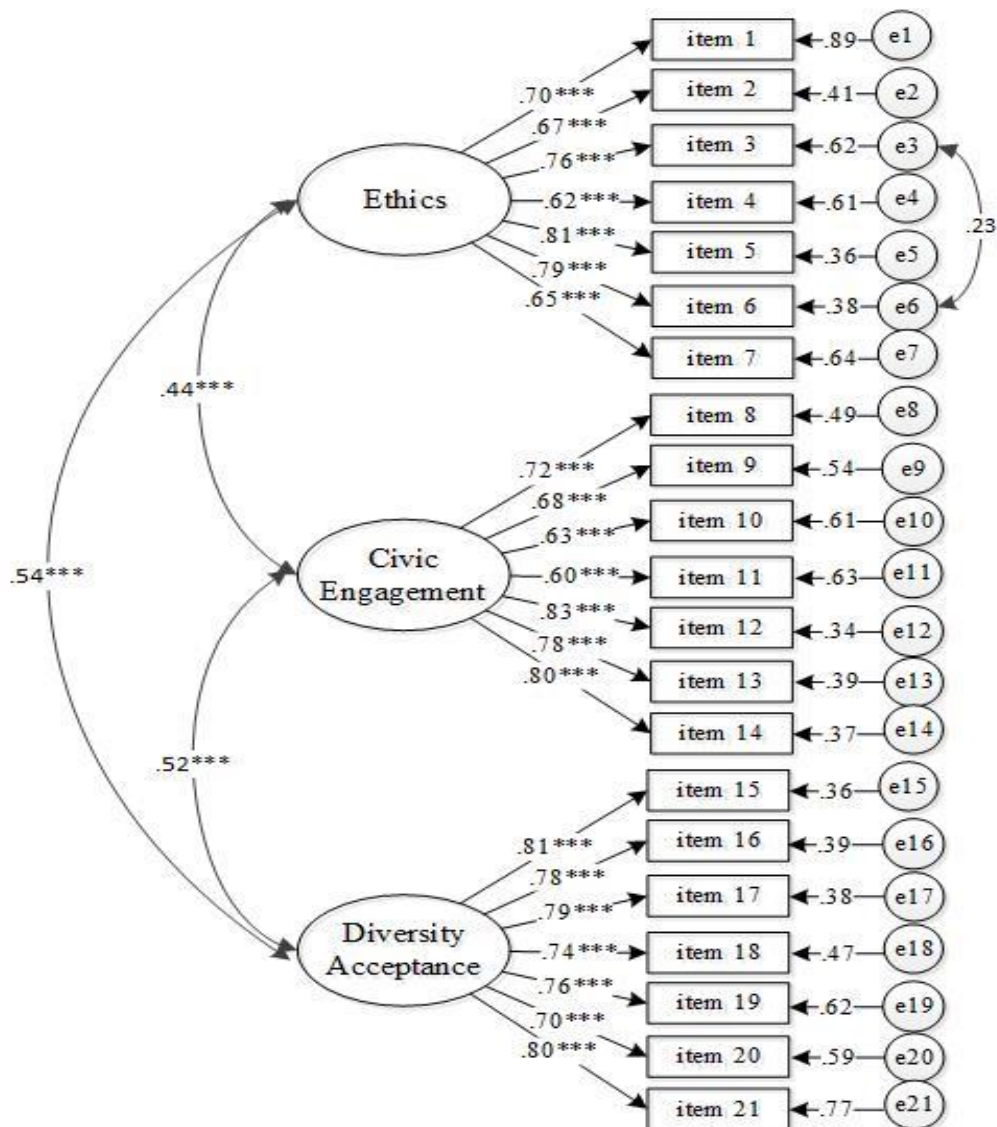
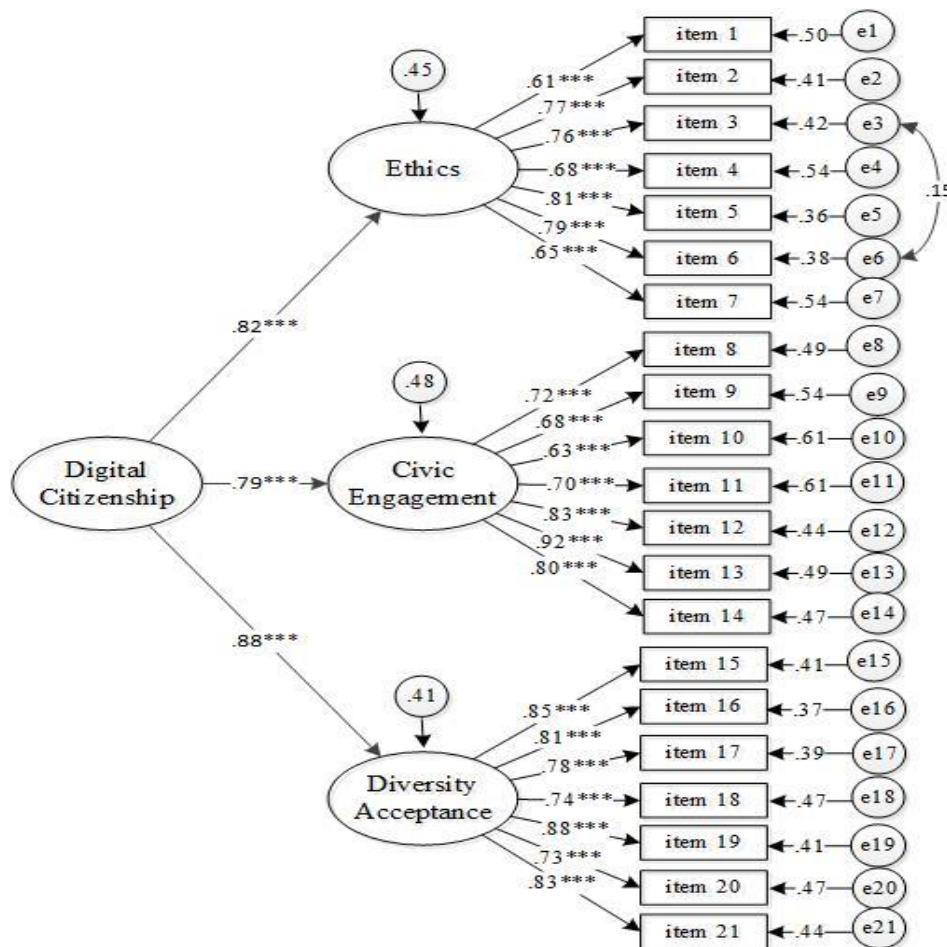*Note.* Standardized coefficients are reported.
***$p < .001$.

The second-order factor model (Model B; see Figure 2) had a fit to the data (SBX^2 = 60.23, *df* = 43, *p* = .042; SRMR = .04; CFI = .97; TLI = .97; RMSEA = .039, 90% CI [.027, .059], BIC = 115.19). The factor's loadings were significant (*p* < .001). The reliability of online ethics (CR = .86, AVE = .55), online civic engagement (CR = .88, AVE = .54), and online diversity acceptance (CR = .92; AVE = .67) factors were acceptable. The difference between Model A and Model B is not statistically significant (ΔSBX^2 = 3.86, Δ*df* = 1, *p* = .049), but BIC in Model B is smaller than in Model A. This difference is greater than 10 (ΔBIC = 16.83), which suggests a better adjustment in model B (see Table 2). Therefore, we chose Model B for the remaining analyses based on statistical and theoretical considerations.

Table 2. Goodness-of-fit Statistic of the Hypothesized Three First-Order and One Second-Order Models Factor Model (N = 750)

Model	SBX^2	df	ΔSBX^2	Δdf	p	BIC	ΔBIC
A. Three first-order factors	64.09	42				132.02	
B. One second-order factor	60.23	43	3.86	1	.049	115.19	16.83

Figure 2. Final Factor Model of Adolescents' Digital Citizenship Behaviors Depicting a Second-Order Factor

Note. Standardized coefficients are reported.
***p < .001.

Sample 2 (Model Cross-Validation)

A multigroup technique was used to test model stability in samples 1 and 2. The multigroup analysis provided evidence of configural (SBX^2 = 115.45, df = 84, p = .013; SRMR = .05; CFI = .95; TLI = .94; RMSEA = .04, 90% CI [.02, .05]), metric and scalar model invariance confirmed in the two samples (see Table 3). We concluded from these results that the second-order factor model is equivalent in both samples.

Table 3. Results on Measurement Invariance Properties Across Calibration (N = 750) and Cross-Validation Sample (N = 750)

Invariance	SBX^2	df	ΔSBX^2	Δdf	p	ΔCFI	$\Delta RMSEA$
Configurational	120.46	86					
Metric	135.54	97	15.08	11	.179	.006	.003
Scalar	143.67	98	23.21	12	.026	.007	.002

Measurement Invariance by Gender (N = 1500)

The configural model that assumed no constraints across groups was used as a baseline model. The CFA confirmed the goodness-of-fit of the configural model (SBX^2 = 112.84, df = 84, p = .019; SRMR = .06; CFI = .97; TLI = .93; RMSEA = .05, 90% CI [.04, .07]). When factor loadings were fit to be similar across gender (metric invariance), the differences in SBX^2 among models configural and metric were not statistically significant (p > .001), and the CFI and RMSEA results were less than .01 and .015, respectively. Then, factor loadings and intercepts were fixed to be equal by gender (scalar invariance), and the difference in the SBX^2 statistic was not statistically significant (p > .001); also, there was no substantial modification in CFI and RMSEA (see Table 4).

Table 4. Goodness-of-Fit Statistic for Testing Measurement Invariance by Gender

Invariance	SBX^2	df	ΔSBX^2	Δdf	p	ΔCFI	$\Delta RMSEA$
Configural	112.68	84					
Metric	145.06	95	7.02	11	.797	.001	.003
Scalar	152.08	96	11.94	12	.451	.007	.002

Latent Means Differences

Latent means differences were examined in the DCS-A factors by gender, with the boys selected as the reference group, and their latent means were set to zero. The means of the girls denoted the difference in latent means between the two groups. In both samples, girls scored higher on online ethics, civic engagement, and diversity acceptance behaviors than males. The effect size indicates these differences have theoretical and practical implications (see Table 5).

Table 5. Latent Means Differences in DCS-A Factors

Factor	ΔM	z	p	Cohen's d
Online ethics	0.32	2.01	.044	0.17
Online civic engagement	0.47	2.52	.012	0.21
Online diversity acceptance	0.31	3.67	.019	0.22

Discriminant Validity (N = 1500)

Subscales of DCS-A had adequate discriminant validity according to the rule of thumb suggested in the literature (Fornell & Lacker, 1981; Hair et al., 2010). The results confirmed that the square of the correlations (R^2) between DCS-A factors was less than the AVE of these subscales (see Table 6).

Concurrent Validity

As expected, online ethics, civic engagement, and diversity acceptance behaviors were negatively correlated to bystanders taking outsiders or reinforcing bully behaviors in cyberbullying events and positively with bystanders defending cyber victims online. The values of the correlations indicate a small ($r > .10$) to high ($r > .30$) effect size, which indicates the explanatory and practical consequences of these relationships (see Table 6).

Table 6. Intercorrelations Between DCS-A Factors and Styles of Bystander Intervention in Cyberbullying Events

Measures	1 AVE = .55	2 AVE = .54	3 AVE = .67	4	5	6
1. OE	-					
2. OCE	.47*** (.22)	-				
3. ODA	.54*** (.29)	.51*** (.26)	-			
4. OB	-.18*** (.03)	-.13*** (.02)	-.26*** (.07)	-		
5. RB	-.28*** (.08)	-.22*** (.05)	-.29*** (.08)	.22***	-	
6. DB	.31*** (.10)	.27***(.08)	.33*** (.11)	-.19***	-.17***	-

Note. OE = online ethics; OCE = online civic engagement; ODA = online diversity acceptance; OB = outside bystander behaviors; RB = reinforcing bystander behaviors; DB = defending bystander behaviors.
Squares correlations are reported in parentheses (R^2)
***$p < .001$.

Discussion

In an era where individuals have shown growing aggressive behaviors and people are increasingly forced to interact online, understanding the underpinnings of responsible use of technology continues to gain relevance. Hereafter, healthy and responsible online interactions are essential for adolescents' socialization, as these are part of their daily life and, thus, will impact their future behaviors. Digital citizenship has proven helpful in explaining, predicting, and improving adolescent online behavior. Thus, measuring digital citizenship remains critical in identifying the leading factors that lead adolescents toward responsible online behavior.

In this study, we examined a multidimensional model of digital citizenship associated with adolescent prosocial behaviors toward others and the community. First, the findings supported that data fit a second-order measurement model for digital citizenship with three first-order factors (online ethics, online civic engagement, and online diversity acceptance). Second, there is empirical evidence of first-order discriminant validity. This result suggests that future studies should examine different antecedents and consequences of these factors. Third, it confirmed the measurement invariance of the second-order factor model for males and females, which is critical for future studies that examine gender group differences in the causes and consequences of digital citizenship factors. Finally, we confirmed that digital citizenship factors are associated with bystander prosocial (defender) and anti-social (outsider and reinforcing) online behaviors. These findings suggest that the scale can explain adolescents' online behavior to others.

Model Dimensionality

Our findings confirm a multidimensional conceptualization of digital citizenship in line with current literature (Choi, 2016; Curran & Ribble, 2017; Kim & Han, 2020; Jones & Michell, 2016). The hypothesized second-order factor model shows that answers to the DCS-A can be arranged into one second-order factor that subsumes three first-order (ethics, civic engagement, and diversity acceptance behaviors). Discriminant validity analysis confirmed that subscales of DCS-A measure a unique construct. Based on this result, we recommend examining whether the three dimensions of digital citizenship have different underpinnings and effects for future research. Additionally, different educational practices must foster these dimensions. In other words, research and intervention in digital citizenship education should explore variables that explain each subscale and their specific consequences on digital citizenship behaviors. These results suggest that DCS-A is a robust psychometric scale to measure this construct in Mexican adolescents. These results are critical, given the scale's potential to provide essential information that might advance the current understanding of digital citizenship and inform future decisions of policymakers.

Measurement Invariance

Our findings support measurement invariance of the DCS-A by gender. That is, digital citizenship is a psychometrically equivalent measure of digital citizenship in males and females. Hence, it is possible to consider that differences in group factor responses result from differences in digital citizenship behaviors rather than measurement bias. This result allows researchers to make meaningful conclusions and hypotheses about the influence of gender on digital citizenship in adolescence and how digital citizenship evolves in both genders.

Based on the confirmation of scalar invariance, we analyzed the latent mean differences in the first-order factor (online ethics, civic engagement, and diversity

acceptance). The study revealed that mean scores for males are significantly lower than for females in online ethics, civic engagement, and diversity acceptance behaviors. These results are consistent with Jones and Michell's (2016) findings. Although further studies are necessary, these results suggest that female adolescents behave more frequently as prosocial digital citizens in online interactions. Thus, future research should examine cultural and psychological variables related to these differences in gender and the effects of these differences on adolescent digital education.

External Validity

Consistent with previous studies, we found that online ethics, civic engagement, and diversity acceptance behaviors are positively associated with defending bystanders. Likewise, results indicate a negative association with anti-social online bystander behaviors (passive outsider or reinforced cyberaggression) in cyberbullying events (Jones & Mitchell, 2016; Vlaanderen et al., 2020). The effect size of these correlations suggests explanatory and practical consequences of this relationship in the short and long term. Overall, findings suggest that digital citizenship should be considered a critical construct to explain adolescent prosocial or anti-social online behaviors in cyberbullying events.

Theoretical and Practical Implications

The study provides researchers with a robust psychometric multidimensional scale for assessing digital citizenship in adolescents. Furthermore, it demonstrates that online ethics, civic engagement, and diversity acceptance behaviors are critical dimensions of digital citizenship in adolescents. Results also confirm that these digital citizenship dimensions help explain adolescent online prosocial and antisocial behaviors. In line with previous research, these dimensions of digital citizenship were found to encourage defender bystander intervention and hinder outsider or reinforcing bystander behavior in cyberbullying events. Thus, future research should explore the effects of online ethics,

civic engagement, and inclusive behaviors on adolescents' online interpersonal and social behaviors. Additionally, as a result of the analysis of mean differences, male adolescents were identified to have lower scores on digital citizenship factors, suggesting that digital citizenship education programs should focus on them. However, these results require further research to explore what triggers and affects such differences.

Findings from this study have implications for practice in helping the academic community understand the roots of behavioral transformation in youths, which may rest in promoting civic behaviors by fostering civic behaviors through different and diverse programs in and out of classrooms. As suggested, further research is imperative given the growing need to educate and reeducate youths for interacting with civic manners in online environments.

Limitations

While the results above support the use of DCS-A, this research has limitations worth mentioning. First, the scale is a self-reported measure of digital citizenship behaviors in adolescents. Students' responses may be influenced in a socially desirable way, thus occasioning bias in the findings. Future studies should use diverse measurement methods (e.g., interviews or observation) and report sources (e.g., teachers and parents). Second, the study samples are from public schools in two states of northwest Mexico. It is warranted to do cross-validation studies of the DCS-A from diverse regions and cultural contexts throughout Mexico (rural and indigenous adolescents). Also, cross-cultural studies that involve other countries are recommended. Finally, the cross-sectional design does not assess longitudinal invariance or understanding of how these constructs evolve and does not assume the causal relationship between dimensions of digital citizenship and adolescents' online behavior. Therefore, longitudinal or experimental research should be pondered to analyze the consequences of digital citizenship on adolescent online behaviors.

Implications for Future Research

The study represents a significant starting point in exploring digital citizenship in adolescents. Despite study limitations, the DCS-A presents a solid theoretical and empirical basis for better understanding the digital citizenship construct. Considering the values of digital citizenship in a digital society, research can use digital citizenship scales capable of offering valid and reliable information about this construct. The empirical evidence supports both genders' validity and measurement equivalence of a second-order factor model of digital citizenship, subsuming three first-order factors (online ethics, online civic engagement, and online diversity acceptance behaviors), which help explain adolescent online behaviors. These results highlight the relevance of the scale for professionals committed to developing psychoeducational interventions to develop interpersonal digital citizenship in adolescents.

Future research should move from digital citizenship behaviors to explore the factors that encourage online citizenship behaviors, such as parental autonomy support (Wang et al., 2021). Furthermore, variables that hinder citizenship behaviors should be examined, such as emotional factors and lack of resources (Bauml et al., 2022). Additionally, scholars should analyze how to create opportunities in the educational environments for students' civic online behaviors.

Acknowledgements

References

Almerich, G., Suárez-Rodríguez, J., Díaz-García, I., & Orellana, N. (2021). The influence of using ICT in high-skills competences and ICT competences. A structural model. *Education and Information Technologies, 26*, 3845–3869. https://doi.org/10.1007/s10639-021-10437- y

Al-Zahrani, A. (2015). Toward digital citizenship: Examining factors affecting participation and involvement in the Internet society among higher education students. *International Education Studies, 8*(12), 203–217. https://doi.org/10.5539/ies. v8n12p203

Anderson, E. L., Steen, E., & Stavropoulos, V. (2017). Internet use and problematic Internet use: a systematic review of longitudinal research trends in adolescence and emergent adulthood. *International Journal of Adolescent and Youth, 22*(4), 430–454. https://doi.org/10.1080/02673843 .2016.1227716

Areepattamil, S., & Khine, M. S. (2017). Early adolescents' use of information and communication technologies (ICTs) for social communication in 20 countries: Examining the roles of ICT-related behavioral and motivational characteristics. *Computers in Human Behavior, 73*, 263–272. https://doi.org/10.1016/j.chb.2017.03. 058

Balakrishnan, V. (2018). Actions, emotional reactions and cyberbullying – From the lens of bullies, victims, bully-victims and bystanders among Malaysian young adults. *Telematics and Informatics, 35*(5), 1190–1200. https://doi.org/10.1016/j.tele.2018.02 .002

Bandalos, D. L., & Finney, S. J. (2019). Factor analysis. Exploratory and confirmatory. In G. R. Hancock, L. M. Stapleton, & R. O. Mueller (Eds.), *The review guide to quantitative methods in the social sciences* (2nd ed., pp. 98–122). Routledge.

Bauman, S., Yoon, J., Iurino, C., & Hackett, L. (2020). Experiences of adolescent witnesses to peer victimization: The bystander effect. *Journal of School Psychology, 80*, 1–14. https://doi.org/10.10 16/j.jsp.2020.03.002

Bauml, M., Smith, V. D., & Blevins, B. (2022). "Who cares?": Young adolescents' perceived barriers to civic action. *Research in Middle Level Education, 45*(3), 1–20. https://doi.org/10.1080/19404476.2022.20 33069

Brown, T. A. (2015). *Confirmatory factor analysis for applied research* (2nd ed.). The Guilford Press.

Byrne, B. M. (2012). *Structural equation modeling with Mplus. Basic concepts, applications, and programming*. Routledge.

Castaño-Pugarín, S. A., Suárez-Betancur, N., Tilano Vega, L. M., Herrera López, H. M. (2021). Internet, social media and online hate speech. Systematic review. *Aggression and Violent Behavior, 58*, Artículo e101608. https://doi.org/10.1016/j.avb.202 1.101608

Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling: A Multidisciplinary Journal, 9*(2), 233–255. https://doi.org/10. 1207/S15328007SEM0902_5

Choi, M. (2016). A concept analysis of digital citizenship for democratic citizenship education in the internet age. *Theory & Research in Social Education, 44*(4), 565–607. https://doi.org/10.1080/00933104.201 6.1210549

Choi, M., Glassman, M., & Cristol, D. (2017). What it means to be a citizen in the internet age: Development of a reliable and valid digital citizenship scale. *Computers & Education, 107*, 100–112. https://doi.org/ 10.1016/j.compedu.2017.01.002

Claravall, E. B., & Evans-Amalu, K. (2020). Self-regulation, and compassion: A critical triad to develop anti-racist digital citizenship in the time of pandemic. *Journal of International Social Studies, 10*(2), 44–59. https://files.eric.ed.gov/fulltext/EJ1266 427.pdf

Coyne, S. M., Padilla-Walker, L. M., Fraser, A. M., Fellows, K., & Day, R. D. (2014).

"Media time = family time": Positive media use in families with adolescents. *Journal of Adolescent Research, 29*(5), 663–688. https://doi.org/10.1177/0743558414538316

Crocetti, E., Erentaitė, R., & Žukauskienė, R. (2014). Identity styles, positive youth development, and civic engagement in adolescence. *Journal of Youth and Adolescence, 43,* 1818–1828. https://doi.org/10.1007/s10964-014-0100-4

Curran, M. B. X., & Ribble, M. (2017). P-20 Model of digital citizenship. *New Directions for Student Leadership, 2017*(153), 35–46. https://doi.org/10.1002/yd.20228

Dedebali, N. C., & Dasdemir, I. (2019). Social studies teacher candidates' perception of digital citizenship. *International Journal of Educational Methodology, 5*(3), 465–477. https://doi.org/10.12973/ijem.5.3.465

DeSmet, A., De Bourdeaudhuij, I., Walrave, M., & Vandebosch, H. (2019). Associations between bystander reactions to cyberbullying and victims' emotional experiences and mental health. *Cyberpsychology, Behavior, and Social Networking, 22*(10), 648–656. https://doi.org/10.1089/cyber.2019.0031

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39–50. https://doi.org/10.1177/002224378101800104

Funder, D. C., & Ozer, D. J. (2019). Evaluating effect size in psychological research: Sense and nonsense. *Advances in Methods and Practices in Psychological Science, 2*(2), 156–168. https://doi.org/10.1177/2515245919847202

Garaigordobil, M., & Larrain, E. (2020). Bullying and cyberbullying in LGBT adolescents: Prevalence and effects on mental health. *Comunicar, 28*(62), 77–87. https://doi.org/10.3916/C62-2020-07

Guasp-Coll, M., Navarro-Mateu, D., Lacomba-Trejo, L., Giménez-Espert, M. C., & Prado-Gascó, V. J. (2021). Emotional skills in adolescents' attitudes towards diversity: Regression models vs qualitative comparative analysis models. *Current Psychology*, Advanced online. https://doi.org/10.1007/s12144-020-01319-6

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis* (7th ed.). Pearson.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). *A primer on partial least squares structural equation modeling* (2nd ed.). Sage.

Harrison, T., & Polizzi, G. (2022). (In) civility and adolescents' moral decision making online: drawing on moral theory to advance digital citizenship education. *Education and Information Technologies*, *27*, 3277–3297. https://doi.org/10.1007/s10639-021-10710-0

Heath, M. K. (2018). What kind of (digital) citizenship? A between-studies analysis of research and teaching for democracy. *International Journal of Information and Learning Technology, 35*(5), 342–356. https://doi.org/10.1108/IJILT-06-2018-006 7

Hernández-Martín, A., Martín-del-Pozo, M., & Iglesias-Rodríguez, A. (2021). Pre-adolescents' digital competences in the area of safety. Does frequency of social media use mean safer and more knowledgeable digital usage? *Education and Information Technologies, 26*(1), 1043–1067. https://doi.org/10.1007/s10639-020-10302-4

Hinduja, S., & Patchin, J. W. (2008). Cyberbullying: An exploratory analysis of factors related to offending and victimization. *Deviant Behavior, 29*(2), 129–156. https://doi.org/10.1080/01639620701457816

Ho, R. (2006). *Handbook of univariate and multivariate data analysis and interpretation with SPSS*. Chapman & Hall/CRC.

Holfeld, B. (2014). Perceptions and attributions of bystanders to cyber bullying. *Computers in Human Behavior, 38*, 1–7. https://doi.org/10.1016/j.chb.2014.05.012

Instituto Nacional para la Evaluación de la Educación (2019). *Panorama educativo de México. Indicadores del Sistema Educativo*

Nacional 2018 Educación básica y media, superior. https://www.inee.edu.mx/wp-content/uploads/2019/08/P1B117.pdf

International Telecommunication Union (2021). *New data from ITU suggest 'COVID-19 connectivity boost'- world's poorest being left far behind.* https://www.itu.int/en/mediacentre/Pages/PR-2021-11-29-FactsFigures.aspx

Isman, A., & Gungoren, O. C. (2014). Digital citizenship. *The Turkish Online Journal of Educational Technology, 13*(1), 73–77. https://eric.ed.gov/?id=EJ1018088

Jones, L. M., & Mitchell, K. J. (2016). Defining and measuring youth digital citizenship. *New Media & Society, 18*(9), 2063–2079. https://doi.org/10.1177/1461444815577797

Jugert, P., Eckstein, K., Noack, P., Kuhn, A., & Benbow, A. (2013). Offline and online civic engagement among adolescents and young adults from three ethnic groups. *Journal of Youth and Adolescence, 42,* 123–135. https://doi.org/10.1007/s10964-012-9805-4

Kara, N. (2018). Understanding university students' thoughts and practices about digital citizenship: A mixed methods study. *Educational Technology & Society, 21*(1), 172–185. https://www.jstor.org/stable/10.2307/26273878

Kim, M., & Choi, D. (2018). Development of Youth Digital Citizenship Scale and implications for educational setting. *Educational Technology & Society, 21*(1), 155–171. https://www.jstor.org/stable/10.2307/26273877

Kim, S., & Han, Y. (2020). Different trajectories of citizenship across latent classes of adolescent online risk behavior. *Children and Youth Services Review, 109*, Article e104731. https://doi.org/10.1016/j.childyouth.2019.104731

Lambe, L. J., Cioppa, V. D., Hong, I. K., & Craig, W. H. (2019). Standing up to bullying: A social ecological review of peer defending in offline and online contexts. *Aggression and Violent Behavior, 45*, 51–74. https://doi.org/10.1016/j.avb.2018.05.007

Lau, W. W. F., & Yuen, A. H. K. (2014). Developing and validating of a perceived ICT literacy scale for junior secondary school students: Pedagogical and educational contributions. *Computers & Education, 78*, 1–9. https://doi.org/10.1016/j.compedu.2014.04.016

Lee, C.-H., Moak, S., & Walker, J. T. (2016). Effects of self-control, social control, and social learning on sexting behavior among South Korean Youths. *Youth & Society, 48*(2), 242–264. https://doi.org/10.1177%2F0044118X13490762

Lyons, R. (2012). *Investigating student gender and grade level differences in digital citizenship behavior* (Publication No. 1038378905) [Doctoral thesis, Walden University]. ProQuest Dissertation and Theses Global.

Machackova, H., Dedkova, L., Sevcikova, A., & Cerna, A. (2018). Bystanders' supportive and passive responses to cyberaggression. *Journal of School Violence, 17*(1), 99–110. https://doi.org/10.1080/15388220.2016.1222499

Marcum, C. D., Higgins, G. E., Ricketts, M. L., & Wolfe, S. E. (2014). Hacking in high school: Cybercrime perpetration by juveniles. *Deviant Behavior, 35*(7), 581–591. https://doi.org/10.1080/01639625.2013.867721

Martin, F., Hunt, B., Wang, C., & Brooks, E. (2020). Middle school student perception of technology use and digital citizenship practices. *Computers in the Schools, 37*(3), 196–215. https://doi.org/10.1080/07380569.2020.1795500

Mueller, R. O., & Hancock, G. R. (2019). Structural equation modeling. In G. R. Hancock, L. M. Stapleton, & R. O. Mueller (Eds.), *The reviewer's guide to quantitative methods in the social sciences* (2nd ed., pp. 445–456). Routledge.

Mueller, M. K., Phelps, E., Bowers, E. P., Agans, J. P., Urban, J. B., & Lerner, R. M. (2011). Youth development program participation and intentional self-regulation skills: Contextual and individual bases of pathways to positive youth development.

Journal of Adolescence, 34(6), 1115–1125. https://doi.org/10.1016/j.adolescence.2011.07.010

Muthén, L. K., & Muthén, B. O. (2017). *Mplus user's guide* (8th ed.). Muthén & Muthén.

Nordin, M. S., Ahmad, T. B. T., Zubairi, A. M., Ismail, N. A. H., Rahman, A. H. A., Trayek, F. A. A., & Ibrahim, M. B. (2016). Psychometric properties of a Digital Citizenship Questionnaire. *International Education Studies, 9*(3), 71–80. https://doi.org/10.5539/ies.v9n3p71

Notten, N., & Nikken, P. (2016). Boys and girls taking risk online: A gendered perspective on social context and adolescents' risky online behavior**. *New Media & Society, 18*(6), 966–988. https://doi.org/10.1177%2F1461444814552379

Organization for Economic Cooperation and Development (2020). *Internet access (indicator).* https://doi.org/10.1787/69c2b997-en

Patterson, L. J., Allan, A., & Cross, D. (2017). Adolescent bystander behavior in the school and online environments and the implications for interventions targeting cyberbullying. *Journal of School Violence, 16*(4), 361–375. https://doi.org/10.1080/15388220.2016.1143835

Peterson, R. A., & Kim, Y. (2013). On the relationship between coefficient alpha and composite reliability. *Journal of Applied Psychology, 98*(1), 194–198. https://doi.org/10.1037/a0030767

Polit, D. F., Beck, C. T., & Owen, S. V. (2007). Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. *Research in Nursing & Health, 30*(4), 459–467. https://doi.org/10.1002/nur.20199

Putnick, D. L., & Bornstein, M. H. (2016). Measurement invariance conventions and reporting: The state of the art and future directions for psychological research. *Developmental Review, 41*, 71–90. https://doi.org/10.1016/j.dr.2016.06.004

Reiner, I., Tibubos, A. N., Hardt, J., Müller, K., Wölfling, K., & Beutel, M. E. (2017). Peer attachment, specific patterns of internet use and problematic internet use in male and female adolescents. *European Child & Adolescent Psychiatry, 26,* 1257–1268. https://doi.org/10.1007/s00787-017-0984-0

Ribble, M. S. (2015). *Digital citizenship in schools* (3rd ed.). International Society of Technology in Education.

Sarmiento, A., Herrera-López, M., & Zych, I. (2019). Is cyberbullying a group process? Online and offline bystanders of cyberbullying act as defenders, reinforces and outsiders. *Computer in Human Behavior, 99*, 328–334. https://doi.org/10.1016/j.chb.2019.05.037

Sherrod, L. R., Flanagan, C., & Youniss, J. (2002). Dimensions of citizenship and opportunities for youth development: The what, why, when, where, and who of citizenship development. *Applied Developmental Science, 6*(4), 264–272. https://doi.org/10.1207/S1532480xads0604_14

Subramanyam, K., & Smahel, D. (2011). *Digital youth: The role of media in development.* Springer. https://doi.org/10.1007/978-1-4419-6278-2

Tokunaga, R. S. (2010). Following you home from school: A critical review and synthesis of research on cyberbullying victimization. *Computers in Human Behavior, 26*(3), 277–287. https://doi.org/10.1016/j.chb.2009.11.014

Torgal, C., Espegale, D. L., Polanin, J. R., Ingram, K. M., Robinson, L. E., El Sheikh, A. J., & Valido, A. (2021). A meta-analysis of school-based cyberbullying prevention programs' impact on cyber-bystander behavior. *School Psychology Review, 52*(2), 95–109. http://doi.org/10.1080/2372966X.2021.1913037

United Nations Educational, Scientific and Cultural Organization (2020). *Digital citizenship as a public policy in education in Latin America.* https://unesdoc.unesco.org/ark:/482223/pf0000376935_eng

Vlaanderen, A., Bevelander, K. E., & Kleemans, M. (2020). Empowering digital citizenship: An anti-cyberbullying intervention to increase children's intentions to intervene on behalf of the victim. *Computers in Human Behavior, 112*, Artículo e106459. https://doi.org/1011 0.1016/ j.chb.2020.106459

Wachs, S., Wright, M. F., Sittichai, R., Singh, R., Biswal, R., Kim, E-M., Yang, S., Gámez-Guadix, M., Almendros, C., Flora, K., Daskalou, V., & Maziridou, E. (2019). Associations between witnessing and perpetrating online hate in eight countries: The buffering effects of problem-focused coping. *International Journal of Environmental Research and Public Health, 16*(20), Artículo e3992. https://doi. org/10.3390/ijerph16203992

Wang, H., Geng, J., Liu, K., Wei, X., Wang, J., & Lei, L. (2021). Future time perspective and self-control mediate the links between parental autonomy support and adolescents' digital citizenship behavior. *Youth & Society, 54*(6), 1077–1096. https://doi.org/ 10.1177/0044118X211020778

Wynd, C. A., Schmidt, B., & Schaefer, M. A. (2003). Two quantitative approaches for estimating content validity. *Western Journal of Nursing Research, 25*(5), 508–518. https://doi.org/10.1177/01939459032 52998

Zhong, J., Zheng, Y., Huang, X., Mo, D., Gong, J., Li, M., & Huang, J. (2021). Study of the influencing factors of cyberbullying among Chinese college students incorporated with digital citizenship: From the perspective of individual students. *Frontiers in Psychology, 12*, Artículo e621418. https://doi.org/10.3389/fpsyg.202 1.621418

Zhu, C., Huang, S., Evans, R., & Zhang, W. (2021). Cyberbullying among adolescents and children: A comprehensive review of the global situation, risk factors, and preventive measure. *Frontiers in Public Health, 9*, Artículo e634909. https://doi.org/ 10.3389/fpubh.2021.63 4909

Zych, I., Farrington, D. P., & Ttofi, M. M. (2019). Protective factors against bullying and cyberbullying: A systematic review of meta-analyses. *Aggression and Violent Behavior, 45*, 4–19. https://doi.org/10.1016 /j.avb.2018.06.008

Appendix

Adolescent Digital Citizenship Scale

Online Ethics

In online interaction…

1. When I face any disagreement online, I watch my language, so it does not come across as mean.

2. When posting or sending pictures of others, I do not to embarrass them or get them into trouble.

3. My favorite places to be online are where people are respectful toward each other.

4. I ensure that things I post will not lead me to regret them later.

5. I do not get involved in disputes and offensive interactions on the internet.

6. I am careful about how I say things online, so they do not come across the wrong way.

7. I do respect others' posts and opinions, even though they do not represent me.

Online Civic Engagement

I have used the Internet to….

8. Improve my school or my community in some way.

9. Help schoolmates or other people.

10. Share publications about missing persons.

11. Raise awareness about social issues in my city/town.

12. Advocate for charity activities that support disadvantaged people in my community.

13. Share helpful information for my schoolmates or others in my community.

14. Advocate for environmental protection programs in my community.

Online Diversity Acceptance

In online setting…

15. I am involved in social networks with people from the different cultural backgrounds.

16. I have friends with different socioeconomic statuses.

17. I have communication with people with disability.

18. I have online friends from a different religion.

19. I have friends with different educational backgrounds.

20. I get into sites where people with diverse political orientations interact.

21. I have friends with different sexual identities and orientations.

Authors / Autores
Valdés-Cuervo, Angel Alberto (avaldes.itson@gmail.com) 🆔 0000-0001-6559-4151   Angel Alberto Valdés-Cuervo. Ph.D. in Sciences by Center of Research of Food and Development. Full-time research professor in the Department of Education of the Technological Institute of Sonora, Mexico. Member of the Mexican Council of Educational Research. Member of the Mexican Academy of Sciences. Member of the National System of Research. Research Interest: Bullying and cyberbullying, family-school relationship, and adolescent online behaviors.   **Author contribution:** (AAVC) Conceptualization, statistical analysis, funding acquisition, writing original draft, writing- review & editing.   **Conflict of interest statement:** AAVC state that they have no conflicts of interest in writing the present article.
Morales-Álvarez, Agustín (agustinmorales_alvz@live.com) 🆔 0000-0002-5653-4082   Agustín Morales-Álvarez. Master in Psychological Research by Technological Institute of Sonora, Mexico. Ph.D. student at the Department of Education, Technological Institute of Sonora. Research interest: adolescent online behaviors, parental socialization.   **Author contribution:** (AMA) Conceptualization, statistical analysis, methodology, project administration, writing-review & editing.   **Conflict of interest statement:** AMA state that they have no conflicts of interest in writing the present article.
Parra-Pérez, Lisbeth Guadalupe (lizparra@gmail.com) 🆔 0000-0001-9247-7663   Lizeth Guadalupe Parra-Pérez. Ph.D. in Education and Human Resources by Colorado State University. Assistant Professor in the Department of Education of the Technological Institute of Sonora. Member of the National Research System in Mexico. Member of the Mexican Council for Educational Research. Member of the American Educational Research Association. Research interest: student performance, policy education issues, bullying.   **Author contribution:** (LGPP) Statistical analysis, methodology, writing- review & editing.   **Conflict of interest statement:** LGPP state that they have no conflicts of interest in writing the present article.
García-Vázquez, Fernanda Inéz (fernanda.garcia@itson.edu.mx) 🆔 0000-0002-8668-2924   Fernanda Inéz García-Vázquez. Ph.D. in Psychology by the University of Sonora. Full-time research professor in the Department of Education of the Technological Institute of Sonora, Mexico. Member of the National Research System in Mexico. Member of Interamerican Society of Psychology. Member of Mexican Council for Educational Research. Research interest: Bullying, human strengths, happiness, and positive psychology.   **Author contribution:** (FIGV) Statistical analysis, methodology, writing- review & editing.   **Conflict of interest statement:** FIGV state that they have no conflicts of interest in writing the present article.

RELIEVE

Revista **EL**ectrónica de **I**nvestigación y **EV**aluación **E**ducativa

E-Journal of Educational Research, Assessment and Evaluation