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Computers & Education

journal homepage: www.elsevier.com/locate/compedu

What it means to be a citizen in the internet age: Development of a reliable and valid digital citizenship scale

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ARTICLE INFO

Article history:

Received 4 October 2016

Received in revised form 28 December 2016

Accepted 3 January 2017

Available online 3 January 2017

Keywords:

Digital citizenship scale

Concept analysis

Factor analysis

Digital citizenship education

ABSTRACT

This study puts forward a comprehensive digital citizenship scale based on carefully calibrated, overarching, inclusive components of digital citizenship that can be used to measure abilities, perceptions, and levels of participation of young adults in Internet based community. The Digital Citizenship Scale (DCS) had a 26-item five-factor model that was extracted using an Exploratory Factor Analysis (EFA), and then cross-validated through a Confirmatory Factor Analysis (CFA). The DCS had respectable good reliability and construct validity, supported by a concept analysis of digital citizenship, the expert panel review, EFA, and CFA. In addition, the DCS was shown to have a convergent relationship with Internet self-efficacy and a divergent relationship with Internet anxiety. As a theoretically rigorous and well developed digital citizenship scale, this study will help understand individuals' perceptions of their abilities and trajectories as active and/or critical members of online communities as part of their everyday lives on local, national, and global levels.

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1. Introduction

One of the Web's most lasting and consequential effects may be the impact it is having on civic engagement (Banaji & Buckingham, 2013; Kahn & Kellner, 2004; Smith, 2013), especially among those who use it most as a tool to reach out into the world in qualitatively new ways. Abilities to extend out into continuously expanding networks of information, to link together with new groups, to engage in online (and offline) civic activities that were once beyond the scope of everyday life demands the exploration of new possibilities for understandings and shared definitions of citizenship. Even relatively casual Internet users are often capable balancing the demands and expectations of the place based contexts with their activities using Internet based technologies to log into ideas beyond traditional boundaries. Users must navigate the natural tensions between their physically bounded spaces along with the open environs of continuously expanding cyberspace as they evolve together in dialectical relationship. These new capabilities have led some to suggest the burgeoning information age is

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introducing a new type of citizen with different perspectives and distributed responsibilities (Hermes, 2006). Perspectives that are less tied to the demands and restrictions of specific place – a citizen that is perhaps more globally aware, more critical, more willing to challenge the immediate – heralding the rise of the digital citizen (Bennett, Wells, & Rank, 2009; Coleman, 2006; Hermes, 2006).

One of the early difficulties in exploring the phenomenon of digital citizenship is being able to capture let alone measure it in a meaningful way. For example, not only in how it changes the relationships individuals have with dominant social structures/networks, but the ways in which restrictions and limitations to digital tools might impact roles and abilities of citizens in the 21st century. Further, psychological variables such as Internet self-efficacy and Internet anxiety have been acknowledged as important traits for both acquiring new understandings and developing new knowledge through Internet use (De Marco, Robles, & Antino, 2014; Livingstone & Helsper, 2009). However, little emphasis has been directed toward research exploring how individuals' sense of digital citizenship and their Internet self-efficacy/anxiety are interrelated. It may be obvious that people who are very confident with searching for information online and evaluating digital resources are more likely to participate in online activities. Advanced citizenship can be highly dependent on agency where the individual needs to reach and be part of a community.

In order to understand the role of individuals in civic life in the shadow of the Web, it is imperative to gain a firmer understanding of what it means: activities it engenders, the ways it changes the perceptions of public issues, the skills that help it to flourish? To help address these questions, in this paper we attempt to develop a valid and reliable digital citizenship scale; self-report digital citizenship scale, an instrument that offers respondents a way to tell their own story about how they understand their civic life on and by the Web in a highly structured context.

2. Digital citizenship: a unique and important concept

2.1. Three theoretical foundations

There have been previous attempts at developing a digital citizenship scale (Isman & Canan Gungoren, 2014; Jones & Mitchell, 2015), but they tend to focus on culturally determined behaviors moved online (e.g. showing respect for respondents, developing sharing skills through participation) with limited psychological and sociological theoretical underpinnings. The Digital Citizenship Scale (DCS) presented in this paper attempts to develop a tool that can offer a more complex, transactive portrait of the individual as they live online (Glassman & Kang, 2016) based in emerging psychological and sociological theories of Internet behavior. In development of the DCS for this study we relied on three general theoretical frameworks along with a concept analysis (described below) to help guide development of scale items that might be responsive to the new civic ecologies created by the Internet. The first theoretical framework is not directly related to the Internet but has important implications for understanding human-Internet transactions: Feenberg (1991) critical approach to technology and the idea that individuals control the behavioral trajectories offered by new technologies. The second, Castells (1996) ideas of a networked society arguing that powerful hubs can manipulate and control spaces of place through the Web's continuous flows of information – foregrounding the notion that digital citizenship is as much a responsibility as it is a possibility. Castell's ideas were used in developing items for power relationships between offline and online venues. The third framework is a still developing Open Source approach to educative processes (Glassman & Kang, 2016), impacting the entire scale, in particular issues of user agency.

2.1.1. Feenberg and a critical approach to technology

Feenberg (1991) suggests that the influence of technologies has two perspectives: an autonomous perspective where technology more or less takes on a life of its own, helping to define and in some circumstances actually drive human activity; and a human controlled perspective, where technologies are neutral and it is decisions about how to use them that eventually defines technology's character in everyday life. This decision-making recognizes technology as an augmentation for extending capabilities, but it can also take users on darker trajectories, including the desire for control. Any good or damage technology should not be blamed on the technology itself, but on the individuals using them; or more likely the culture/society that sets the context for individual choices.

We view the Internet as a paradox unique among tools. The Internet can be used to manipulate societies towards more hegemonic systems of governance, or it can be a tool that leads these same societies towards more participatory expression and critique of traditional institutions. Social trajectories are basically up for grabs in a small way every time users decide to log on; based on whether and how they use the Web as an augmentation of civic engagement.

2.1.2. Castells and civic citizenship in the space of flows

The second theoretical construct that informed the development of the scale is Manuel Castell's ideas of an increasingly networked society (1996). Castells suggests that the Internet creates new contexts and processes for the flows of information to individual users. Spaces of place control information through embedded structures and institutions, often deeply indebted to the social and cultural histories of contiguous social/physical environments. It is difficult to change sources of information in spaces of place. Bounded information can serve as a force for stability among those who live in those places: creating a means for shared, sustainable identity. Those who control information in spaces of place are also often stakeholders in the social networks that help define individual and group activities.

The new spaces of information flows created by the Internet change both the roles of information and those who control it. When users log on they reach out to information that is provided by online networks, or more particularly the central hub(s) that so often dominate networks. The true goals of these online networks can be opaque to the user. The central hubs of the information networks play much the same role(s) as the place based structures and institutions, but with limited if any ties to the cultures/histories of the individuals using them. The hubs dominate the networks, and therefore control the flow of information, through power systems that are distant and detached from the users they are affecting. The power might come from brand, from material resources, from digital expertise. The spaces of information flows can be so effective so as to negate the role(s) of place based institution.

2.1.3. Open source as an approach to online engagement

The idea of an open source approach is more amorphous than the two frameworks above, and as much based in practice as philosophy. It is taken primarily from practices of the Open Source programming communities that emerged in the late twentieth century (Moody, 2001), Eric Raymond's recounting of their genesis and sustainability (1999), and the Open Source initiative that emerged as a result of both. An open source approach focuses on the development of both individuals as sophisticated users of Internet technologies so that boundaries between use of tools to achieve goals and/or enter into digital relationships and abilities to establish, sustainable communities/networks of purpose become transparent. In this paper we focused on the development individual/psychological abilities that allows users to move easily between the centripetal forces of their spaces of place and the centrifugal possibilities of Web based activities (Glassman, 2013).

There are a number of open source skills (Glassman & Kang, 2011), which have also been termed Internet literacy, digital literacy, or media and information literacy, (Simsek & Simsek, 2013) that help make the boundary between the everyday lives of users and their activities on the Internet more transparent. Who individuals are as citizens in the Internet age then can be very much determined by their skill levels. The skill levels in turn the consequence of the types and qualities of Internet based experiences in their lives (Glassman, 2013).

The general context of the development of the DCS then was a focus on individuals and the active choices they make. There is for Internet users a continuous but perhaps growing tension between the stability/identity but also restrictions inherent to their everyday, place based lives and the possibilities of new discoveries and new ways of doing things along with the possibilities of alienation and distant control of online networks.

2.2. Relevant literature review of digital citizenship

There have been a number of attempts to define digital citizenship over the past decade. The DCS is in very large part dependent on an analysis of those attempts. The items and factors of the scale are the result of a broad examination of the concept of digital citizenship as will be made clear in the next section. Here we will highlight some of the primary work on digital citizenship that has helped to inform development of the scale.

Some scholars have explored digital citizenship from the perspective of media and information literacy (Simsek & Simsek, 2013). These fundamental skills are highly dependent on experience, suggesting a key issue in the development of digital citizenship is characterized as the digital divide; differences in both Internet portals but also speed through broadband access. It is however not simply general access issues that impact digital citizenship but the time and especially the places where that access is possible. Some form of access to bandwidth and/or basic Internet literacy skills may be a necessary but not sufficient categories for understanding the development of digital citizenship. There are almost certainly other ecological factors, some of which we do not yet even recognize, that impact different aspects of digital citizenship.

A number of researchers have considered digital citizenship as a wider category than traditional civic participation and political action (Bennett et al., 2009; Kahne, Lee, & Feezell, 2013). Bennett et al. (2009) argue that online engagement often encompasses a number of superficially variant activities such as visiting popular culture websites, gaming, and using Internet platforms for self-expression. As an example, becoming an active member of subReddit community can often demand advanced decision-making as to when and/or how they participate in ongoing online discussion. Similarly individuals may engage in advanced collaborative activities on multi-user gaming platforms in ways not possible in other online or offline ecologies of their everyday lives (Lenhart et al., 2011). And there has been development of Internet user as a new type of consumer outreach but for ethical consumption rather than material consumption (Hirzalla and van Zoonen 2010). They found organizations such as Greenpeace use affective models to draw users in to new perspectives of the world; processes that often focus more on developing a new and more critical understanding of phenomenon than direct political activity. These types of user activities might increase citizenship from a broader perspective but not necessarily the type that is attached to direct political action.

Wellman et al. (2003) used a number of surveys to make the argument that Internet communications are moving us towards a society where citizenship is less based on local or cultural historical solidarity and more on what they refer to as networked individualism. Place based social groups may be losing abilities to pull individuals into generalized civic relationships based on traditional boundaries and/or physically contiguous relationships. While Castells (1996) suggested that these place based institutions would be replaced by networks organized around centralized, powerful hubs, Wellman et al. (2003) suggest citizenship will be distributed, based in individual agency, where users follows their own (utilitarian) interests (as suggested by Internet researcher/theorists such as Bennett et al., 2009 and Downes, 2010.). This networked individualism/distributed citizenship might allow individuals to be more successful in meeting their own needs, in smaller targeted

communities where relationships and goals can be more transparent; leading users to become less interested in offline political groups and the online sites that mirror them (Banaji & Buckingham, 2013).

Some researchers described digital citizenship in relation to Internet-specific skills and self-efficacy which is regarded as a focal point for determining critical differences between users in their abilities to engage in online platforms in civic discourse and/or activities (De Marco et al., 2014; Hargittai & Hinnant, 2008). Some studies revealed that communicating/collaborating with others is directly associated with Internet self-efficacy and media/information literacy (Aesaert, Van Nijlen, Vanderlinde, & van Braak, 2014; Livingstone and Helsper, 2009), as an important aspect of digital citizenship. De Marco et al. (2014) also argued that how much users participate in online community depends on their Internet competency (which from a socio-cognitive perspective would be directly related to Internet self-efficacy).

2.3. Exploring the concept of digital citizenship

At the core of the DCS presented in this paper is a concept analysis of the term digital citizenship (Choi, 2016). A concept analysis is a methodology to clarify meanings, classify, compare, delineate, and refine concepts providing validity for developing measurement instruments (Pett, Lackey, and Sullivan, 2003). Using Rodgers (1989) evolutionary approach to concept analysis, categories leading to construction of a concept of digital citizenship were identified through a thorough review of publicly available data.

Four categories of digital citizenship were identified as being central to the concept: *Digital Ethics, Media and Information Literacy, Participation/Engagement, and Critical Resistance*. 1) *Digital Ethics* refers to Internet users' engagement in safe, ethical, and responsible online behaviors. Some studies emphasized concepts of digital citizenship should be conscious of political, social, economic, and cultural issues in society and the world related to the burgeoning information technologies (Hollandsworth, Dowdy, & Donovan, 2011; Ribble, 2004; Winn, 2012). 2) *Media and Information Literacy* denoted Internet users' abilities to access the Internet, evaluate information, communicate, cooperate and/or collaborate with others using the Internet (D'Haenens, Koeman, & Saey, 2007; Moeller, Joseph, Lau, & Carbo, 2011; Simsek & Simsek, 2013). Different psychological capabilities such as cognitive-intellectual abilities to analyze and interpret online information and socio-communicative abilities to network with others were emphasized. 3) *Participation/Engagement* signified using the Internet to participate in the political, economic, social, and cultural place based activities of the user – whether local, societal or national (Citron & Norton, 2011; Ohler, 2012). Although political centered perspectives such as e-voting and e-petition using social networks sites were pervasive, some studies focused on individuals' personalized interest-driven participation (e.g. using virtual reality platforms such as Second Life). 4) *Critical Resistance* introduced transformative participation challenging the status quo and promoting social justice via the Internet, which is more complex and difficult to achieve. (Coleman, 2006; Herrera, 2012). The incidents of Arab Spring and Occupy Wall Street are exemplars of *Critical Resistance*. This category seems similar to the third category of *Participation/Engagement* in that they are both based in agency and goal driven activity. However, *Critical Resistance* is more non-traditional and non-hierarchical in nature while *Participation/Engagement* is more dependent on existing, place based social structures/institutions. For example, political *Participation/Engagement* represents joining a political party to agitate for change while *Critical Resistance* involves organizing a protest to challenge the legitimacy of that party.

3. Methods

This study centered on using survey research in development of a self-report Digital Citizenship Scale. The emphasis and nature of the framework (individual agency) and the complexity of the relationships between behavior, cognition and social contexts suggests self-report as a better methodology for measuring a phenomenon such as digital citizenship. Indeed, it was Bandura (1994) who pioneered this type of self-report survey to understand individual/user driven activities. The data were collected through a paper-based survey distributed to student populations to increase response rates (Shih & Fan, 2008). Exploratory factor analysis (EFA), confirmatory factor analysis (CFA), and correlational analyses were used to determine underlying dimensions of digital citizenship and to assess their reliability and validity.

3.1. Participants

There were 508 participants consisting of 436 undergraduate (85.8%) and 72 graduate students (14.2%) at a large mid-western university (Table 1). Based on Tapscott's (2009) definition of net generation, the participants were born between January 1977 and December 1997. This study was conducted during 2014 autumn semester. The mean age of the subjects was 21.03 years with the range being 18 years–35 years. There were 188 males (37%) and 311 females (62.8%) with 1 unidentified. The racial composition of the sample was 410 Whites (80.7%), 50 Asian/Pacific Islanders (5.9%), 26 Blacks (5.1%), 26 Bi-racial (5.1%), 7 Hispanics (1.4%). The participants were primarily majoring in social science (n = 216, 42.5%) or education (n = 211, 41.5%).

3.2. Procedure

We sought to use procedures as valid as possible in developing scale items. This study was implemented in three phases to create a reliable, valid instrument to measure a perceived sense of digital citizenship among young adults (however the scale should be usable for a variety of age ranges).

3.2.1. Phase one: concept analysis for item generation

This preliminary part of the study was conducted to provide greater depth of understanding about digital citizenship for item generation. For this, a concept analysis was conducted which is a useful method to examine meanings, characteristics, and/or attributes of abstract constructs for the purpose of a concept's clarification. The search process is as follows:

3.2.1.1. Addressing surrogate terms of digital citizenship. The researchers reviewed literature with regard to the Internet and how it might influence concepts of citizenship. Six general terms other than digital citizenship were found to dominate the literature: online citizenship, cyber citizenship, e-citizenship, networked citizenship, technological citizenship, and Internet citizenship.

3.2.1.2. Searching the data. Three online database searches (EBSCO, ERIC, and Google Scholar) were conducted using seven key phrases mentioned above. A total of 254 items were culled from the initial search.

3.2.1.3. Establishing the criteria for inclusion and exclusion. The researchers established 5 criteria for inclusion and 2 criteria for exclusion. Criteria for inclusion were 1) must be written by English, 2) must be part of the field of communication/journalism, political science, and/or education, 3) must be published or released between January 2003 and September 2014, 4) must be from one of the following data sources (journal articles, book chapters, white papers, and official websites/blogs), 5) must provide some explanations of what citizenship means in association with the Internet and digital technologies. The two criteria for exclusion were 1) if data sources do not provide meanings of digital citizenship and 2) if data sources simply cite other scholar's definitions. As a result, 30 articles, 6 white papers, 4 book chapters, and 17 blogs/websites were coded and analyzed.

3.2.1.4. Coding and analyzing data. The selected data were coded according to five categories (author, publication year, title, data sources, texts that include definitions of digital citizenship, emerging themes). And then the researchers who are experts in Internet studies, citizenship studies, and global education cross-checked and double-checked if the coded data and analysis were properly implemented.

Table 1
Demographics of the participants.

Variable	% (N)
Age (N = 504)	
18–20	51.6 (260)
21–25	41.9 (211)
26–30	5.3 (27)
31–35	1.2 (6)
Gender (N = 508)	
Male	37.0 (188)
Female	62.8 (319)
Prefer not to disclose	0.2 (1)
Ethnicity (N = 506)	
White	80.7 (410)
Black	5.1 (26)
Hispanic	1.4 (7)
Asian/Pacific islander	5.9 (30)
Bi-racial	5.1 (26)
Other	0.6 (3)
Prefer not to disclose	0.8 (4)
Highest level of education (N = 508)	
High School	85.8 (436)
Bachelor's degree	13.8 (70)
Master's degree	0.4 (2)
Major (N = 508)	
Human Science	2.4 (12)
Social Science	42.5 (216)
Natural Science	8.6 (44)
Education	41.5 (211)
Medicine	2.0 (10)
University Exploration	3.0 (15)

As a result, four sub categories were found (Ethics, Media and Information Literacy, Participation/Engagement, and Critical Resistance) (Choi, 2016) and an initial list of scale items was generated based on these categories combined with examination of three relevant theoretical frameworks.

3.2.2. Phase two: expert review for item revision

After generating the initial items, an expert panel was recruited by the researchers and asked to review the survey items regarding the wording, response format, instrument directions, and quality of the items to minimize ambiguities, misunderstandings, or other inadequacies (DeVellis, 2012). The twelve panel members were recruited based on their expertise in global education, literacy, educational psychology, Internet studies, and citizenship studies. Each of the panel members was asked to review the first generation of items and provide feedback on perceived difficulties and/or issues that might have been overlooked in development of the items. The brief results of a concept analysis of digital citizenship were provided to help them understand how and why the scale items were constructed. The guided questions provided to members of the panel were: 1) Are there any questions unclear or difficult to understand? 2) Are there any questions irrelevant to digital citizenship? 3) Do you have any relevant items with regard to digital citizenship that should be added to this scale in your mind? 4) Any comments and suggestions that you would like to provide in general?

Eight out of twelve panel members responded to this request with input: items were added, deleted, and/or revised based on this first round of feedback. After the scale was revised based on the first round review, the eight responsive experts were invited to participate in a second review. Five of the eight experts provided feedback. Experts' open-ended suggestions were examined carefully and used to determine item inclusion, exclusion, and revision for the final scale.

3.2.3. Phase three: recruitment

A convenience sample of undergraduate and graduate students at a large, Mid-Western University was used for the survey. Once IRB approval was obtained the researchers contacted directors and coordinators of two learning centers and 15 class instructors in three colleges in order to gain access to the target population. The researchers received permission from 13 instructors to conduct research in their classrooms and learning centers. The questionnaire was handed out in the class along with consent forms after the researchers' presentation on the research topic and procedure. All participants volunteered to be part of the study.

3.3. Measures

3.3.1. Demographic information

The questionnaire included demographic information of the respondents with regard to age, gender, ethnicity, educational level, and major.

3.3.2. Digital citizenship

Thirty-seven scale items were finalized based on a concept analysis of digital citizenship and expert reviews. The scale items were constructed by the elements of four categories of digital citizenship already mentioned in the introduction: *Ethics, Media and Information Literacy, Participation/Engagement, and Critical Resistance*. A 7-point Likert type scale ranging from 1 (strongly disagree) to 7 (strongly agree) was used.

3.3.3. Internet self-efficacy

Participants' perceived self-efficacy in Internet based activities was measured using the Internet self-efficacy scale (Kim & Glassman, 2013). Internet self-efficacy refers to ones' belief in their abilities to successfully complete a variety of Internet activities. Since users' Internet competency is regarded as a fundamental factor influencing digital participation (De Marco et al., 2014), we can assume Internet self-efficacy is positively correlated with digital citizenship. Cronbach's alpha of the Internet self-efficacy scale in the current study was 0.92. A 7-point Likert type of scale ranging from 1 (strongly disagree) to 7 (strongly agree) was used.

3.3.4. Internet anxiety

State-Trait Anxiety Inventory (STAI; Spielberger, Vagg, Barker, Donham, and Westberry, 1980) was adapted to measure participants' level of anxiety in engaging in Internet activities. The STAI was used as a negative correlate because anxiety is generally perceived as negatively correlated with self-efficacy. For this study the STAI was modified to measure participants' subjective feelings in using the Internet. A 7-point Likert type of scale ranging from 1 (strongly disagree) to 7 (strongly agree) was used. Cronbach's alpha of the inventory in the present study was 0.67.

3.4. Data analyses

The statistical analyses were conducted in four steps. First, data screening was conducted to double check if the collected data can be used for factor analysis (Field, 2013). Descriptive statistics such as mean, standard deviation, variance, minimum, and maximum of the entire scale items along with graphical plots of data distributions were examined. All 37 items were tested in order to identify if there were any deviant items. Examination of the single item distribution suggested that there

were no deviant items that needed to be removed from the scale. Then correlation matrix was examined to see inter-correlation between variables (Pett et al., 2003). When items are highly correlated ($r > 0.80$) it is suggested they be removed from the scale because of multicollinearity issues (Field, 2013): no items were removed from the scale. A sample is considered adequate if the Kaiser-Meyer-Olkin (KMO) is greater than, 0.5 (Pett et al., 2003). The KMO for this analysis was 0.80, which indicated an acceptable sample. As a result, the original 37 items were used for an Exploratory Factor Analysis (EFA).

Second, in order to examine underlying structure or relationships between variables that constitute the concept of digital citizenship, EFA was conducted using half of the total sample ($n = 254$). To determine the number of factors, Kaiser's criteria (factors with an eigenvalue greater than one) and Cattell (1966) scree test (retaining factors above the elbow of the curve and rejecting those below it), and theoretical interpretability of the resulting factor structures were used (Field, 2013). Principal axis factoring for an extraction method and Oblimin for a rotation method were used for this study to produce more accurate results (Costello & Osborne, 2005).

Third, in order to test a proposed factor structure extracted from the EFA, a Confirmatory Factor Analysis (CFA) was used with the second half of the total sample. Modification index that Amos provides and theoretical foundations were considered to improve a model fit. To evaluate the degree of fit between the model and the data, model-fit-criterion that Reinard (2006) and Lomax and Schumacker (2012) provided were used: Relative chi-square ($\chi^2/d.f. < 0.20$), Goodness-of-fit index (GFI close to 0.90), Comparative Fit Index (CFI close to 0.90), Root Mean Square of Error Approximation (RMSEA between 0.05 and 0.08). The values that meet this criterion indicate a good model fit.

Fourthly, a series of correlation analyses were conducted to test the scale's construct validity. Correlation between digital citizenship and Internet self-efficacy and Internet anxiety was analyzed.

4. Results

4.1. Exploratory factor analysis: A 26-item five-factor model

A 26-item measure with five-factors was found from EFA (Table 2): nine items measuring a factor named *Internet Political Activism*, four items measuring a factor named *Technical Skills*, two items measuring a factor named *Local/Global Awareness*, seven items measuring a factor named *Critical Perspective*, and four items measuring a factor named *Networking Agency*. Eleven items (item 1, 2, 3, 4, 5, 6, 18, 20, 21, 27, 33) out of the 37 items were removed based on the predetermined criteria (factor loading < 0.40). The factors including individual items retained in the final scale and their factor loadings are provided in Table 1. By convention, each factor usually holds at least three items but it is sometimes acceptable if at least two items are loaded on a factor (Reinard, 2006). Moreover, given that the factor named *Local/Global Awareness* has high factor loadings, it is noted that this factor is separate and unique from the other factors. Descriptive statistics on the five factors are also presented in Table 3. *Internet Political Activism* had the lowest means while *Technical Skills* had the highest means.

4.2. Reliabilities and validity of the DCS

The reliabilities of each factor and the entire items were calculated. The Cronbach's alphas were 0.83, 0.84, 0.89, 0.80, and 0.67 respectively for *Internet Political activism*, *Technical Skills*, *Local/Global Awareness*, *Critical Perspective*, and *Networking Agency* (Table 4) Cronbach's alpha for the entire items was 0.88.

Construct validity of the DCS was tested through correlation analysis with Internet self-efficacy and Internet Anxiety scales. As expected, the DCS showed significant positive correlations with Internet self-efficacy ($0.57, p < 0.01$) and significant negative correlations Internet anxiety ($-0.22, p < 0.01$). The magnitude between digital citizenship and Internet self-efficacy was moderate while the magnitude between digital citizenship and Internet anxiety was weak.

4.3. Confirmatory factor analysis

The five five-factor structure with 26 items extracted from the EFA was cross validated with the second half of the sample ($n = 254$) using a confirmatory factor analysis (CFA) with maximum likelihood estimation. Although most items had moderate and high loadings on their respective factors the initial model did not meet the criteria for relative chi-square ($\chi^2/d.f. < 0.20$). When an initial model does not fit, researchers should improve the model based on modification indices and theoretical reasons (Byrne, 1998). And researchers should stop fitting the model once the model has a proper fit and subsequent models do not improve the fit any more. The modification indices indicated an additional covariance path between the error terms of items 17 and 19 that would most significantly improve the model fit. After rerunning the second model, relative chi-square still did not meet the criteria for reasonable model fit. Other covariance paths between the error terms of items 11 and 12, 36 and 37, 26 and 30, which were theoretically related items, detected and then the model was rerun. The final model (Fig. 1) resulted in a moderate to good fit (Table 5). Even if two items 12 and 37 had low loadings on *Networking Agency* and *Critical Perspective* respectively, the researchers decided to keep the items because of their theoretical importance to the scale as a whole.

Table 2
The digital citizenship scale items and the respective factor loadings.

Items	F1	F2	F3	F4	F5
<i>Factor 1: Internet Political Activism (IPA)</i>					
25. I attend political meetings or public forums on local, town, or school affairs via online methods.	0.75				
28. I work with others online to solve local, national, or global issues.	0.68				
30. I organize petitions about social, cultural, political, or economic issues online.	0.65				
17. I regularly post thoughts related to political or social issues online.	0.60				
24. I sometimes contact government officials about an issue that is important to me via online methods.	0.58				
19. I express my opinions online to challenge dominant perspectives or the status quo with regard to political or social issues.	0.56				
29. I sign petitions about social, cultural, political, or economic issues online.	0.55				
26. I work or volunteer for a political party or candidate via online methods.	0.46				
23. I belong to online groups that are involved in political or social issues	0.45				
<i>Factor 2: Technical Skills (TS)</i>					
9. I can use the Internet to find information I need.		0.92			
10. I can use the Internet to find and download applications (apps) that are useful to me.		0.78			
8. I am able to use digital technologies (e.g., mobile/smart phones, Tablet PCs, Laptops, PCs) to achieve the goals I pursue.		0.72			
7. I can access the Internet through digital technologies (e.g., mobile/smart phones, Tablet PCs, Laptops, PCs) whenever I want.		0.60			
<i>Factor 3: Local/Global Awareness (LGA)</i>					
13. I am more informed with regard to political or social issues through using the Internet.			0.89		
14. I am more aware of global issues through using the Internet.			0.83		
<i>Factor 4: Critical Perspective (CP)</i>					
34. I think online participation is an effective way to make a change to something I believe to be unfair or unjust.				–0.68	
36. I think I am given to rethink my beliefs regarding a particular issue/topic when I use the Internet.				–0.68	
22. I think online participation is an effective way to engage with political or social issues				–0.55	
32. I think online participation promotes offline engagement.				–0.54	
37. I think the Internet reflects the biases and dominance present in offline power structures.				–0.52	
31. I am more socially or politically engaged when I am online than offline.				–0.50	
35. I use the Internet in order to participate in social movement/change or protest.				–0.47	
<i>Factor 5: Networking Agency (NA)</i>					
16. Where possible, I comment on other people's writings in news websites, blogs, or SNSs I visit.					0.64
11. I enjoy communicating with others online.					0.50
12. I enjoy collaborating with others online more than I do offline.					0.47
15. I post original messages, audio, pictures, or videos to express my feelings/thoughts/ideas/opinions on the Internet.					0.44

Table 3
Mean and standard deviation of DCS.

Factor	N of item	Mean (SD)
Internet Political Activism	9	1.98 (0.91)
Technical skills	4	6.51 (0.59)
Local/Global Awareness	2	5.37 (1.37)
Critical Perspective	7	3.77 (1.14)
Networking Agency	4	3.86 (1.09)

5. Discussion

This study suggests that the DCS presented in this paper is a valid and reliable measure for assessing individuals' sense of digital citizenship. EFA yielded a five-factor structure of digital citizenship; *Internet Political Activism*, *Technical skills*, *Local/Global Awareness*, *Critical Perspective*, and *Networking Agency*. Further, digital citizenship was significantly associated with other relevant constructs, Internet self-efficacy and Internet anxiety, supporting the validity of the DCS.

5.1. Unexpected findings

There were three unexpected findings that after reflection, and taking possible contextual issues into account, seem both logical and important. The first unexpected finding was that the items related to digital ethics were not extracted from a subscale of the DCS. Given the issues of trolling and/or the recruitment of participants by Islamic State, ethical, responsible, and safe use of the Internet and technology is a significant element of digital citizenship especially from educational perspectives. However, six items associated with digital ethics were not statistically classified into a factor of digital citizenship.

Table 4
Item-total correlation & internal consistency of the DCS.

Factor	Item	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Total correlation
IPA	17	0.60	0.81	0.83 (9 items)
	19	0.53	0.82	
	23	0.55	0.82	
	24	0.53	0.82	
	25	0.63	0.81	
	26	0.38	0.83	
	28	0.66	0.80	
	29	0.53	0.82	
	30	0.65	0.81	
	30	0.65	0.81	
TS	7	0.58	0.84	0.84 (4 items)
	8	0.64	0.81	
	9	0.80	0.76	
	10	0.71	0.78	
LGA	13	0.81		0.89 (2 items)
	14	0.81		
CP	22	0.58	0.77	0.80 (7 items)
	31	0.51	0.78	
	32	0.50	0.79	
	34	0.59	0.77	
	35	0.54	0.78	
	36	0.63	0.76	
	37	0.44	0.80	
NA	11	0.50	0.57	0.67 (4 items)
	12	0.36	0.66	
	15	0.43	0.61	
	16	0.51	0.56	

One of the possible reasons can be that there might be possibilities for the participants not to be honest on items concerning ethical questions (e.g., illegal downloading, use of offensive languages, posting pictures without permission). There is also the possibility that ethical decisions involving Internet behavior involve different decisions than non-Internet behaviors (e.g. relative importance of cultural capital and social capital, [Kang & Glassman, 2010](#)).

Second, *Critical Perspective* sub-scale had a negative relationship with the other four sub-scales in the DCS. The participants in the study saw using the Internet to develop more critical approaches to information as qualitatively different from their other everyday uses of the Internet. *Critical Perspective* can actually be interpreted by two related ways; 1) abilities to look at different perspectives or to use the perspective of the other in the development of new ideas, ([Sayer, 2009](#)), and 2) as part of the process of decolonizing knowledge by promoting thinking that challenges the status quo ([Smith, 1999](#)). Put another way, users with advanced *Critical Perspective* see online activity as valuable for continuously comparing to traditional forms of engagement with new possibilities. Users become are capable of rethinking the idea of the Internet from a neutral technology for information communication/distributing to a tool potentially subject to the same biases as all other human tools ([Feenberg, 1991](#)). The best way to use the Internet for greater understanding is not as a tool of authority but one that allows for exploring, comparing, exchanging and augmenting ideas.

Interestingly, the *Critical Perspective* subscale items were negatively associated with all other factors in the scale. This may mean that at least the participants in this study see using the Internet to develop and take critical perspectives as qualitatively different from more traditional forms of citizenship such as being good information consumers or being politically active in ways that reflect place based behaviors. Most Web based activity is promoted as proactive – establishing social circles (e.g. Facebook), finding answers to problems (Google, Wikipedia), getting a good price on a product (Amazon), or taking a course that was previously unavailable (e-learning). In these situations the Internet can easily be perceived as a neutral tool where online activity does not, or should not challenge the social order. We suggest that the development of critical perspectives for these populations is more organic, a function of high levels of connectivity between information sources, opportunities to explore alternative possibilities by clicking through links. One caveat to both the finding and our explanation for it is that the results may be a consequence of the particular population used in this study; the fact that the sample is unevenly distributed, especially in terms of ethnicity (White centered) and social class should be taken into account. More marginalized populations might be more willing to integrate *Critical Perspective* into their broader views/understandings of the Internet.

The third unexpected, and perhaps related finding was that the mean scores for *Internet Political Activism* were by far the lowest of any sub-scales, even *Critical Perspective* which we initially hypothesized to be more complex and difficult to achieve. As mentioned earlier we expected *Critical Perspective* to have the lowest mean scores among participants, but this actually fell to the *Internet Political Activism* factor. This may partially be because Internet activism involves action-oriented and transformation-driven undertakings – the types of goal driven activities currently difficult to sustain in Web based contexts. Or it may be the result of participants not (yet) believing Internet based participation can have important impacts on their place based lives; young peoples' recent online participation is much closer to their individual interests and needs ([Bennett et al., 2009](#); [Wellman et al., 2003](#)) than transformation of larger institutional structures.

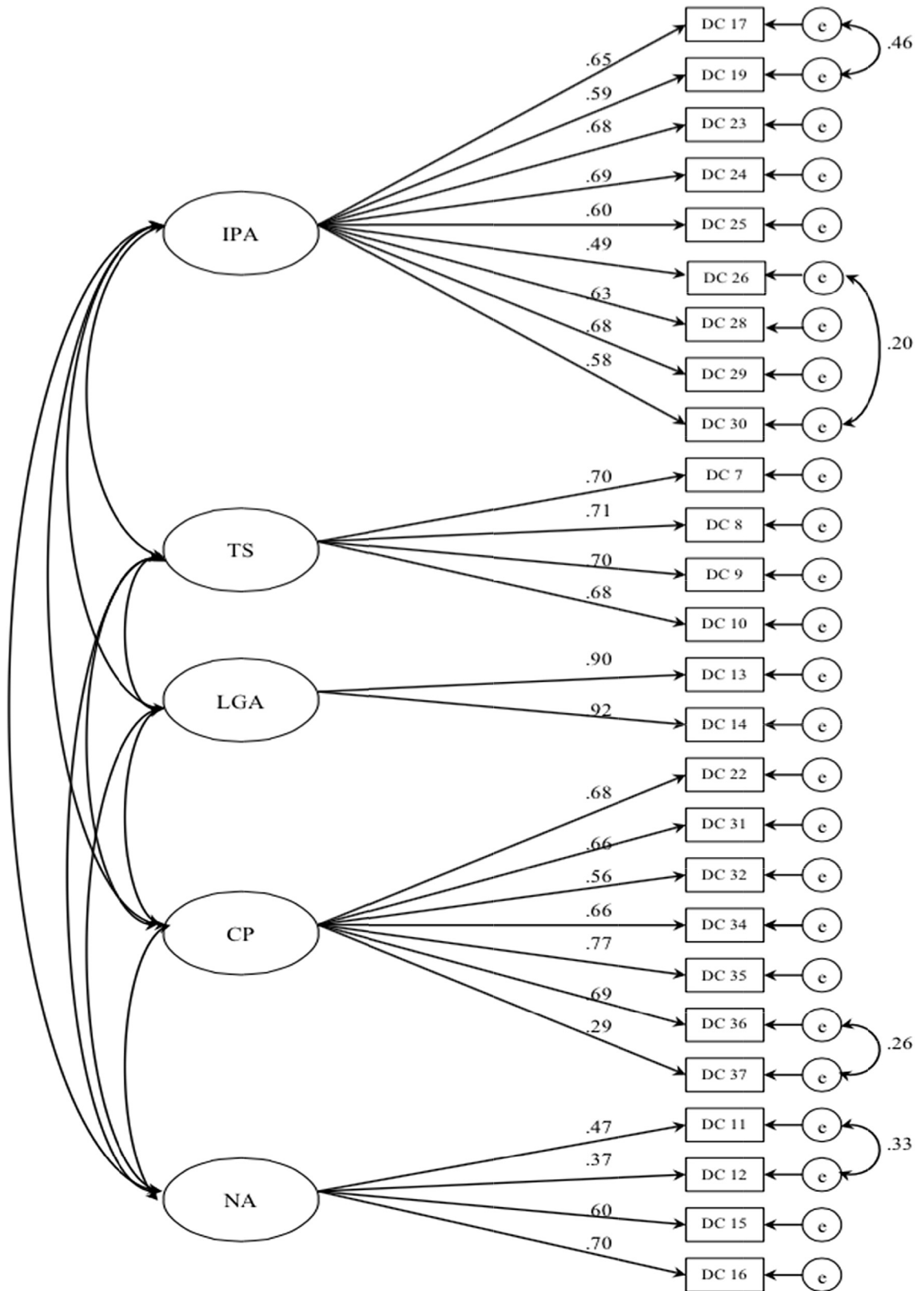


Fig. 1. CFA model of the Digital Citizenship Scale.

Table 5
The Model Fits of CFA model of the Digital Citizenship Scale.

	χ^2	d.f.	χ^2 /d.f.	GFI	CFI	RMSEA
Original model	652.493	289	2.258	0.834	0.855	0.071
Second model	599.078	288	2.080	0.848	0.876	0.065
Final model	552.961	285	1.940	0.861	0.893	0.061

5.2. Three conditions of complexity of digital citizenship

Using the five-factor structure of digital citizenship as statistical evidence embedded within the theoretical perspectives elaborated in the earlier section we argue for three ascending conditions for achievement of advanced digital citizenship (Fig. 2).

The first necessary (but not sufficient) condition for digital citizenship involves *Technical Skills* - lower levels of media and information literacy and basic open source intelligence skills (Glassman & Kang, 2012). As predicted, *Technical Skills* had the highest means at 6.51 and the lowest standard deviation. We suggest this is partially because this condition/factor is the baseline and/or fundamental element for successfully using the Internet for more complex, encompassing conditions of digital citizenship: without mastery of these skills it would not be possible to properly practice digital citizenship of any type. An individual actually has to make relatively little effort, cognitive investment, and/or critical judgment about online participation in appropriating these technical skills through their everyday use of the Web. The four scale items in this factor are consistent with lower levels of media and information literacy found through the concept analysis as well as more basic open source skills which promote successful engagement in online activities, thinking, and, goal driven activities.

The second defined condition of digital citizenship is associated with abilities to search, organize and differentiate information that allow for higher levels of *Local/Global Awareness*. This factor had the highest mean score other than *Technical Skills*. One possible reason for this might be that it is relatively easy for the participants to find and/or become consumers of new information sources related to relevant problems in their lives across ecological levels (from micro to macro, Bronfenbrenner, 1977) – leading to information awareness that was much rarer pre-Internet. User relationships with information sites (often found with the help of search engines) are usually based in unilateral relationships – the site produces the information and the user consumes it. The users have the option of appropriating the information into their thinking, but are not usually offered options such as critical response and/or working with others extending the scope of the information as part of a knowledge building community. In traditional commerce situations the extended reach of the Internet can offer users more options and greater understanding of competing possibilities in choosing particular products. The same phenomenon can help improve understanding of local and global issues when used in ethical consumption scenarios (Hirzalla and van Zoonen, 2010) as explained in the literature review section.

The third condition of complexity of digital citizenship is linked with users becoming part of Internet based communities through collaborative and cooperative online activities; augmenting the thinking of both individuals and goal directed communities, expanding the users' abilities and willingness to connect with others, engaging in critical thinking and/or political activities on the Internet. This condition is part of *Networking Agency*, *Critical Perspective*, and *Internet Political Activism*. The scale items in *Networking Agency*, which can be seen as gateway capabilities for *Critical Perspective* and *Internet Political Activism* are related to higher levels of media literacy and more advanced open source skills/abilities/self-efficacy such as generating content, reacting to content, and joining and working to help sustain collaborative and/or cooperative communities.

5.3. Limitations and future research

Based on the aforementioned results and discussion, there are a number of limitations for this study. First, two psychological scales regarding Internet self-efficacy and Internet anxiety were used to test construct validity of the DCS. Given that citizenship is closely interrelated with political participation, if the study had assessed correlations with other online civic engagement scales there would have provided more balanced construct validity of the DCS. Future research is needed to gain higher validation of the DCS using other relevant instruments relating to online participation as they are developed. Second, the *Local/Global Awareness* factor in this study has only two items. Although many scales have some factors with two items, it is conventionally suggested that there be at least three items in a single subscale, allowing for methodologically and statistically strong interpretation (Zwick & Velicer, 1986). In light of the ideas that being informed with local and global issues is of paramount importance in this globalized and networked society it is important that future research provides more items supporting this factor. Lastly, the data used in this research were collected at a relatively homogenous, large Mid-western university. Thus, the findings should be interpreted with caution because the research sample might not be representative of the Net generation as a whole in the US, or especially more distant societies. For example, a technical skill factor including Internet access could have different means from other populations living in other locations.

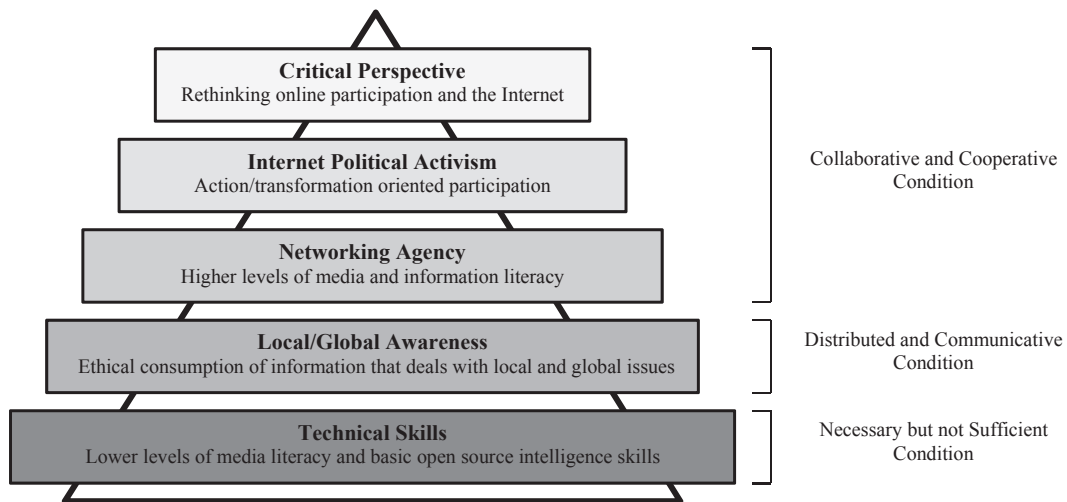


Fig. 2. Three conditions of complexity of digital citizenship.

6. Conclusion

The DCS measures individuals' abilities, perceptions, and levels of participation in goal oriented and Internet based community at different conditions of complexity. This scale has important implications to educate students to become informed and active digital citizens, suggesting the types of factors and/or conditions needed to achieve higher levels of digital citizenship. The study revealed that while some elements of digital citizenship such as technical skills and local/global awareness can be relatively easy to achieve, other more complex and action oriented capabilities that might foster advanced digital citizenship such as networking agency, critical perspective, and internet political activism can be more difficult to attain. These results help reestablish (digital) citizenship centered curricula and instruction, and provide concrete ideas of what should be taught first for digital citizenship education. For example, students should be taught to take responsibility, but more in terms of being a productive member of a shared, project based online community. Students need to be taught to help to organically develop governance systems that are unique to the particular online community, avoiding activities that might negatively impact both traditional and online communities.

Digital citizenship is not static, stable, and/or fixed but a dynamic, flexible, multifaceted, and/or multilayered concept that is interlinked with individuals' everyday online and offline activities. Although traditional approaches to citizenship centered on place based contexts of individuals' everyday activities, we argue that a cohesive concept of digital citizenship should be more globally aware, more critical, and more concerned with goal-oriented participation beyond traditional boundaries. The DCS presented in this paper is a starting point, and as such cannot be ideal; but we believe it has the potential to contribute statistically and theoretically in developing more advanced and higher quality understandings of digital citizenship.

References

- Aesaert, K., Van Nijlen, D., Vanderlinde, R., & van Braak, J. (2014). Direct measures of digital information processing and communication skills in primary education: Using item response theory for the development and validation of an ICT competence scale. *Computers & Education*, 76, 168–181.
- Banaji, S., & Buckingham, D. (2013). *The Civic Web. Young people, the internet, and civic participation*. Cambridge, MA: MIT Press.
- Bandura, A. (1994). *Self-efficacy*. John Wiley & Sons, Inc.
- Bennett, W. L., Wells, C., & Rank, A. (2009). Young citizens and civic learning: Two paradigms of citizenship in the digital age. *Citizenship Studies*, 13(2), 105–120.
- Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. *American psychologist*, 32(7), 513.
- Byrne, B. M. (1998). *Structural equation modeling with LISREL, PRELIS, and SIMPLIS*. NJ: Lawrence Erlbaum Associates.
- Castells, M. (1996). *The rise of the network society: The information age: Economy, society, and culture* (Vol. 1). Oxford: Blackwell Publishers.
- Cattell, R. B. (1966). The scree test for the number of factors. *Multivariate behavioral research*, 1(2), 245–276.
- 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.
- Citron, D., & Norton, H. (2011). Intermediaries and hate speech: Fostering digital citizenship for our information age. *Boston University Law Review*, 91, 1435–1484.
- Coleman, S. (2006). Digital voices and analogue citizenship: Bridging the gap between young people and the democratic process. *Public policy research*, 13(4), 257–261.
- Costello, A. B., & Osborne, J. W. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment Research & Evaluation*, 10(7). Available online <http://pareonline.net/getvn.asp?v=10&n=7>.
- D'Haenens, L., Koeman, J., & Saeys, F. (2007). Digital citizenship among ethnic minority youths in The Netherlands and Flanders. *New Media & Society*, 9(2), 278–299.
- De Marco, S., Robles, J. M., & Antino, M. (2014). Digital skills as a conditioning factor for digital political participation. *The European Journal of Communication Research*, 39(1), 43–65.
- DeVellis, R. (2012). *Scale development: Theory and applications* (Vol. 26). Thousand Oaks, CA: Sage Publications.

- Downes, S. (2010). New technology supporting informal learning. *Journal of Emerging Technologies in Web Intelligence*, 2(1), 27–33.
- Feenberg, A. (1991). *Critical theory of technology*. NY: Oxford University Press.
- Glassman, M. (2013). Open source theory. 01. *Theory & Psychology*, 23(5), 675–692.
- Glassman, M., & Kang, M. J. (2011). The logic of wikis: The possibilities of the Web 2.0 classroom. *International Journal of Computer-Supported Collaborative Learning*, 6(1), 93–112.
- Glassman, M., & Kang, M. J. (2012). Intelligence in the internet age: The emergence and evolution of Open Source Intelligence (OSINT). *Computers in Human Behavior*, 28(2), 673–682.
- Glassman, M., & Kang, M. J. (2016). Teaching and learning through open source educative processes. *Teaching and Teacher Education*, 60, 281–290.
- Field, A. (2013). *Discovering statistics using IBM SPSS statistics*. Thousands Oaks, CA: Sage.
- Hargittai, E., & Hinnant, A. (2008). Digital inequality differences in young adults' use of the Internet. *Communication Research*, 35(5), 602–621.
- Hermes, J. (2006). Citizenship in the age of the internet. *European Journal of Communication*, 21(3), 295–309.
- Herrera, L. (2012). Youth and citizenship in the digital age: A view from Egypt. *Harvard Educational Review*, 82(3), 333–352.
- Hirzalla, F., & van Zoonen. (2010). Affective political marketing Online: Emotionality in the youth sites of Greenpeace and WWF. *International Journal of Learning and Media*, 2(1), 39–54. http://dx.doi.org/10.1162/ijlm_a_00040.
- Hollandsworth, R., Dowdy, L., & Donovan, J. (2011). Digital citizenship in K-12: It takes a village. *TechTrends*, 55(4), 37–47.
- Isman, A., & Canan Gungoren, O. (2014). Digital citizenship. *Turkish Online Journal of Educational Technology*, 13(1), 73–77.
- Jones, L. M., & Mitchell, K. J. (2015). Defining and measuring youth digital citizenship. *New Media & Society*, 17(5), 1–17.
- Kang, M. J., & Glassman, M. (2010). Moral action as social capital, moral thought as cultural capital. *Journal of Moral Education*, 39(1), 21–36.
- Kahne, J., Lee, N. J., & Feezell, J. T. (2013). The civic and political significance of online participatory cultures among youth transitioning to adulthood. *Journal of Information Technology & Politics*, 10(1), 1–20.
- Kahn, R., & Kellner, D. (2004). New media and internet activism: From the 'Battle of Seattle' to blogging. *New media & society*, 6(1), 87–95.
- Kim, Y., & Glassman, M. (2013). Beyond search and communication: Development and validation of the Internet Self-efficacy Scale (ISS). *Computers in Human Behavior*, 29(4), 1421–1429.
- Lenhart, A., Madden, M., Smith, A., Purcell, K., Zickuhr, K., & Rainie, L. (2011). *Teens, kindness and cruelty on social network sites: How American teens navigate the new world of "Digital Citizenship"*. Washington, DC: Pew Internet & American Life Project.
- Livingstone, S., & Helsper, E. (2009). Balancing opportunities and risks in teenagers' use of the internet: The role of online skills and internet self-efficacy. *New Media & Society*, 11(8), 1–25.
- Lomax, R. G., & Schumacker, R. E. (2012). *A beginner's guide to structural equation modeling*. Routledge Academic.
- Moeller, S., Joseph, A., Lau, J., & Carbo, T. (2011). *Towards media and information literacy indicators*. Paris, France: United Nations Educational, Scientific and Cultural Organization.
- Moody, G. (2001). *Rebel code: Inside linux and the open source revolution*. Cambridge, UK: Perseus.
- Ohler, J. (2012). Digital citizenship means character education for the digital age. *Education Digest: Essential Readings Condensed for Quick Review*, 77(8), 14–17.
- Pett, M., Lackey, N., & Sullivan, J. (2003). *Making sense of factor analysis: The use of factor analysis for instrument development in health care research*. Thousands Oaks, CA: Sage.
- Reinard, J. (2006). *Communication research statistics*. Thousands Oaks, CA: Sage.
- Ribble, M. (2004). Digital citizenship: Addressing appropriate technology behavior. *Learning & Leading with Technology*, 32(1), 6–11.
- Rodgers, B. L. (1989). Concepts, analysis, and the development of nursing knowledge: The evolutionary cycle. *Journal of Advanced Nursing*, 14, 330–335.
- Sayer, A. (2009). Whose afraid of critical theory? *Current Sociology*, 57, 767–786.
- Shih, T. H., & Fan, X. (2008). Comparing response rates from web and mail surveys: A meta-analysis. *Field methods*, 20(3), 249–271.
- Simsek, E., & Simsek, A. (2013). New literacies for digital citizenship. *Contemporary Educational Technology*, 4(2), 126–137.
- Smith, L. (1999). *Introduction to Decolonizing methodologies*. London: Zed.
- Smith, A. (2013). *Civic engagement in the digital age*. Washington, DC: Pew Internet & American Life Project.
- Spielberger, C. D., Vagg, P. R., Barker, L. R., Donham, G. W., & Westberry, L. G. (1980). Factor structure of the state–Trait anxiety inventory. In I. G. Sarason, & C. D. Spielberger (Eds.), *Stress and anxiety* (Vol. 7, pp. 95–109). Washington, DC: Hemisphere.
- Tapscott, D. (2009). *Grown up digital: How the net generation is changing your world*. New York, NY: McGraw Hill.
- Wellman, B., Quan-Haase, A., Boase, J., Chen, W., Hampton, K., Díaz, I., & Miyata, K. (2003). The social affordances of the internet for networked individualism, 8: 0 *Journal of Computer-Mediated Communication*. <http://dx.doi.org/10.1111/j.1083-6101.2003.tb00216.x>.
- Winn, M. R. (2012). Promote digital citizenship through school-based social networking. *Learning & Leading with Technology*, 39, 10–13.
- Zwick, W. R., & Velicer, W. F. (1986). Comparison of five rules for determining the number of components to retain. *Psychological bulletin*, 99(3), 432–442.