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Digital Generations Paradox in Pre- and In-service Teachers' Literacy Practices: An Explanatory Sequential Mixed Methods Study

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Abstract

Digital practices have become more prominent due to the growing demand in digital exposure in education. While technology has been used as a metaphorical divide between generations in many studies, very few studies include individuals' definitions of their generational sense of belonging. By administering an online questionnaire (N=111) and conducting semi-structured interviews with pre-service and in-service teachers (n=6), this mixed methods study aimed to capture participants' self-definitions and changes in these definitions. The results of this study provided evidence about the convergence impact of technology in educators' personal and professional lives. This study contributes to the field of digital literacy by offering different perspectives about digital generations and discussing the use of technology to create collaborative and cooperative educational settings.

Keywords: Convergence culture, digital generations, digital literacies, in-service teachers, mixed methods research, pre-service teachers

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Hizmet Öncesi ve Hizmet İçi Öğretmenlerin Okuryazarlık Uygulamalarında Dijital Nesiller Paradoksu: Açıklayıcı Sıralı Karma Yöntemler Araştırması Çalışması

Özet

Dijital uygulamalar, eğitimde artan dijital kullanıma maruz kalma ile daha da önemli hale gelmiştir. Pek çok çalışmada teknoloji, metaforik bir ayrım unsuru olarak kuşakları ayırt etmede kullanılsa da çok az sayıda çalışma, bireylerin kendilerini hangi kuşağa ait olarak tanımladıklarına odaklanmıştır. Öğretmen adayları ve öğretmenler ile çevrimiçi nicel soru formu (N=111) ve yarı-yapılandırılmış görüşmeler (n=6) kullanarak yapılan bu karma yöntemler araştırması çalışmasında katılımcıların dijital kuşaklar kavramına ilişkin tanımları ve bu kavramlardaki değişimler incelenmiştir. Bu çalışmadan elde edilen sonuçlar, eğitmenlerin kişisel ve profesyonel yaşamlarında teknolojinin birleştirme kültürü etkisini ortaya koymuştur. Bu çalışma, dijital kuşaklara ilişkin farklı perspektifleri sunarak ve işbirlikli eğitim ortamları oluşturmada teknolojinin kullanımını tartışarak dijital okuryazarlık alanına katkı sağlamaktadır.

Anahtar kelimeler: Birleştirme kültürü, dijital kuşaklar, dijital okuryazarlık, karma yöntemler araştırması, öğretmenler, öğretmen adayları

Introduction

Technology has become an essential component of individuals' lives widely and brought about categorizing generations based on their digital practices. Studies focusing on generations consider social movements (e.g., wars, pandemics, scientific improvements, economic problems) as the indicators of different categories (Pew Research Center, 2015). Prensky (2001), however, conceptualizes technology with the metaphor of language and defines people by their year of birth. Prensky (2001) groups people in two major categories and identifies people who were born after 1990 as digital natives, whereas others who were born before 1990 as digital immigrants. Based on this metaphorized language competency, the relationship between digital natives and digital immigrants in educational areas is discordant (Prensky, 2001, 2010), which we call the digital generations paradox.

The digital generations paradox has left a contested concept in the literacy domain. While some studies have challenged this paradox (e.g., Bennet & Maton, 2010; Buckingham, 2006; Helsper & Eynon, 2010; Smith et al., 2020; Spiegel, 2021), others have accepted this categorization and conceptualized their studies around this paradox (e.g., Cozma & Hallaq, 2019; Dyikuk, 2019; Grigoryan, 2018; Li et al., 2020; Oriji & Torunarigha, 2020). Both types of studies closely examined young generations' dispositions, including learners' attitudes (Grigoryan, 2018), language acquisition (Men & Noordin, 2019), characteristics of ideal teachers (Helaluddin et al., 2020), and local digital culture (Watson, 2013).

Boyd (2014) argued that the concept of digital natives and immigrants "has serious unintended consequences" (p. 179). We observed in the literature that one of these unintended consequences is the lack of participants' voices about their sense of belonging to digital generational groups. The lack of understanding of participants' perceptions of their sense of belonging is a problem because the pre-determined definitions of people have produced stereotypical mindsets about digital practices among generations (Bennet & Maton, 2010; Smith et al., 2020). This mindset discriminates against people, especially in educational settings where teachers from different generations work together and incorporate digital practices into their teaching. Understanding how pre-service and in-service teachers, who experience intensive exposure to digital practices in education, locate themselves within Prensky's digital generations metaphor can help researchers understand differences in personal practices and preferences in educational settings. In addition, this understanding may allow modifications to the existing digital practices to better prepare the next generations of teachers.

Therefore, the purpose of this study was to capture pre-service and in-service teachers' self-definitions of digital generations and the change in these definitions based on their digital practices. Three specific research questions were addressed in this study:

1. To what extent do pre-service and in-service teachers' self-identification about digital generations align with the digital generations concept?

2. How do pre-service and in-service teachers describe their digital generation positionality drawing on their digital practices?

3. How do age cohort and pre-service and in-service teachers' self-identification about digital generations explain participants' digital characteristics?

Conceptual Framework

This study was informed by two theories: (a) Convergence culture (Jenkins, 2006) and (b) new literacy practices (Knobel & Lankshear, 2011). The first theory is convergence culture, which is explained by Jenkins (2006) as the confluence of old and new practices, especially in technology-related practice. The confluence is both in the material culture (e.g., shift from mobile phones to smartphones) and in practical culture (e.g., getting used to touch screen). Jenkins (2006) states that the nature of convergence culture leads to a paradigmatic shift that ought to be manifested in people's daily lives. Hence, convergence culture has three components: (a) Media convergence, (b) participatory culture, and (c) collective intelligence.

Media convergence refers to the liquidity of the media context across different platforms and media outlets (Jenkins, 2006). The circulation of content is contingent on users' preferences that change the center of production. More importantly, the variety of platforms and content leads to creating a narrative that is different than ever before. Jenkins (2006) explains that media convergence "integrate[s] multiple texts to create a narrative so large that it cannot be contained within a single medium" (p. 242). That is, when a product is introduced in the market, there are various forms of that product for people to use. For instance, when a new movie is launched, the market also introduces cartoons, comics, toys, and materials about that movie for daily use. These auxiliary materials serve the purpose of carrying the small fractions of a grand narrative, which makes the user a part of this narrative. Hence, media convergence creates a multidimensional narrative not only in the entertainment market but also in other facets of life. As education is one of these facets, in this study, we focus on capturing the manifestation of multidimensional narrative through pre-service and in-service teachers' perspectives.

Participatory culture refers to being part of an active digital environment that has a particular focus of use, such as close Facebook groups. The dominant discourse today is that younger generations use participatory platforms (e.g., YouTube) more profoundly than older generations. Because digital use gets prominent among school-age individuals, some literacy scholars (e.g., Gee, 2014; Merchant, 2007) address that schools might fail to liberate students' digital practices, which encapsulates the biggest gap between teachers and students. Jenkins (2006, 2009) capitalizes on this point and states that participatory culture provides a support system that helps learners improve their participation as the learner is surrounded by like-minded people through digital participation. In the context of this study, participatory culture refers to teachers' negotiation regarding digital positionality within generational cohorts, considering where they are positioned in the different parts of the generational spectrum.

Collective intelligence builds upon participatory culture in Jenkins' framework (2006) and refers to a cumulative body of knowledge and practice that stems from the investment of members who have similar interests. As participatory culture creates a venue in which people can interact and learn from each other, the participation turns into a repository that people can utilize whenever they need. Within an affinity group, people may help each other to solve a personal problem and they can become a support mechanism for each other (Lammers et al., 2012). In the context of this study, collective intelligence refers to how teachers employ and utilize the repository that they build with people around them. In addition, we pay attention to whether and how collective intelligence becomes a support system.

The second theory that informs this study is the new literacies theory. New literacies theory postulates a different literacy perspective to correspond to the differences in digital change in daily life (Knobel & Lankshear, 2011). As convergence culture documents the dimensions of digital change, new literacies theory attests the convergence by focusing on the daily use of technology and social learning. More importantly, as digital advancements change our practice (Jenkins, 2009), the values also change accordingly (Lankshear & Knobel, 2011). Because the values are configured through practices that are encultured from interaction on platforms (Knobel & Lankshear, 2011), the participatory nature of digital practice shakes the core of the traditional values and brings the new ones. When researchers need to rethink and redefine the relationships, positionalities, and interaction among people, new literacies theory helps scholars think through a digital lens. Although the literacies perspective brings about person-specific or platform-specific practices that are almost impossible to aggregate under a term, the collectiveness of like-minded people helps at least categorize human practices. Hence, in this study, new literacies are manifested versions of convergence culture through pre- and in-service teachers' digital use.

In addition to these two theories, there is a need for us to explain the concepts of generational cohorts and digital generations in order to better communicate the purpose of this study. Generational belonging and aggregation have been conflicting topics for the digital generations concept. It is hard to find markers that define when generations begin and end (Urick, 2012). Moreover, it becomes hard to understand the prominent characteristics of the generations. As Prensky (2001) used generational attributions as a metaphorical concept, how to understand generational cohorts becomes more important. Hence, in this study, we followed Dimock's (2019) generational taxonomy to capture as much meaningful generational sense as possible.

As this study engages multiple generations within its concept, we have used four generational cohorts that refer to certain age groups of participants. Pre-service and in-service teachers are expected to belong to the four generational cohorts. Hence, generation such as Silent Age (1928-1945) is excluded as these teachers are already retired. Drawing on Dimock (2019), these four generational cohorts are: a) Baby Boomers (1946-1964), b) Generation X (1965-1980) (from now Gen X), c) Generation Y (1981-

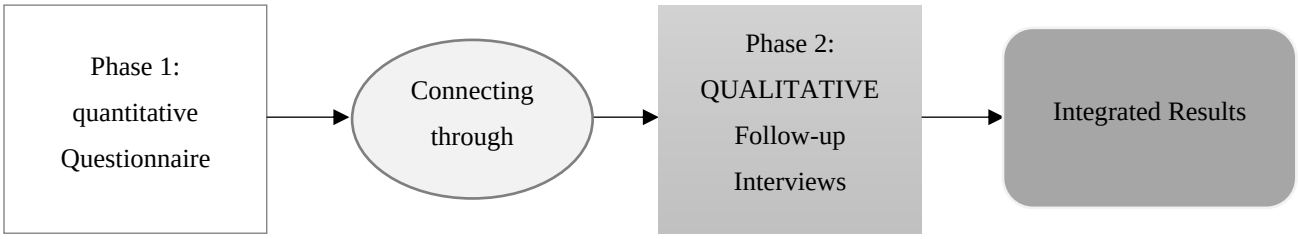
1996) (from now Gen Y), and d) Generation Z (1997-2012) (from now Gen Z). Because these generational cohorts are defined participants' years of birth, they are also assigned generational cohorts.

Methods

To address the study purpose, we employed an explanatory sequential mixed methods design, which involves collecting, analyzing, and intentionally integrating quantitative and qualitative data (Creswell & Plano Clark, 2018). In this study, we put an emphasis on the qualitative phase (quan → QUAL) because our rationale for using a sequential mixed methods design was explanation. Explanation refers to the use of one type of data to explain results generated by the other (Bryman, 2006, 2008). In the context of our study, we aimed to better understand pre-service and in-service teachers' self-definitions of digital generations based on their age cohorts. This study was informed by dialectical pluralism paradigm. Dialectical pluralism, which is used when researchers have qualitative, quantitative, and mixed methods research questions, helps researchers integrate qualitative and quantitative data in a study in a dialogical manner (Johnson, 2017). Consistent with the logic of the study design (Figure 1) and rationale, we first present the methods and results of the quantitative phase. Then, we describe the procedures for connecting quantitative and qualitative phases with participant selection followed by the methods and results of the qualitative phase. We conclude with integration of both phases in the final discussion.

Figure 1.

Procedural Diagram of Digital Generations Paradox in Pre- and In-service Teachers' Literacy Practices



Quantitative Phase: Methods

The purpose of the first, quantitative phase was to examine the extent to which pre-service and in-service teachers' self-identification about digital generations align with the digital generations concept. This section describes methods of quantitative phase of the study.

Participants

We used convenience and purposive sampling strategies to recruit pre-service and in-service teachers. Pre-service teachers were undergraduate students who were majoring in education at two Southern public universities in the United States. In-service teachers were active teachers who were employees of a school district in the city where these two universities are located. Both groups of participants were recruited in the 2020-2021 academic year (at the time of the COVID-19 pandemic) when the use of technology was organically an obligation for every pre-service and in-service teacher.

Therefore, when recruiting pre-service and in-service teachers, we included all pre-service and in-service teachers who were willing to participate in the study regardless of their major or subject area. To capture the generational positionality, pre-service teachers' college years and in-service teachers' years of experience were not considered as an exclusion criterion. A total of 68 pre-service and 43 in-service teachers took the questionnaire (N_{Total}=111).

Data Collection Tool

Our theoretical frameworks drove the selection of the quantitative data collection tool in this study. We used a modified version of the Digital Characteristic Scale developed by Thompson (2013) and only administered the first part of the scale (i.e., digital characteristics) as an online questionnaire. The digital characteristics questionnaire consists of 15 items that focus on identifying participants' approach to learning on topics that are personal interests. The original scale asked participants to rate themselves on a scale from one to eight from one being the most *traditional* approach to learning and eight being the most *digital*. However, we modified this and used 5-Likert scale with one being the most *traditional* and five being the most *digital* instead of 8-Likert scale because the psychometric literature suggests that having more scale points might be better but does not change much when more than 7-Likert scale (Boateng et al., 2018). The questionnaire was administered through Microsoft Forms online data collection tool.

The only demographic data collected from the participants were participants' year of birth. In order to prevent creating discomfort in participants, we did not directly ask participants' ages. Instead, drawing on Dimock (2019), we created four intervals of years that are definitive of the beginning and end of the generations. Then, we asked participants to locate their year of birth in a corresponding interval without revealing the exact age. Right after the birth year interval, we provided participants the brief definition of digital native and digital immigrant and asked them how they would define themselves regarding this definition. We also asked an open-ended question for the participants to provide reasons for their self-definition. At the end of the questionnaire, participants were asked whether they would be willing to be interviewed, and if so, asked to provide an email address.

Data Analysis

Prior to the data collection, both authors obtained the approvals of the institutional review board from their affiliate institutions (10.03.2020/Pro00104763-Appendix B). After providing informed consent, participants answered the online questionnaire, typically completed in 15-20 minutes. Quantitative data were analyzed using descriptive statistics (i.e., mean, standard deviation, frequencies). The first author was involved in data collection and analysis with participant identifiers available. The second author was involved in the data analysis process after the first author de-identified the data.

Quantitative Phase: Results

To address the first research question —*To what extent do pre-service and in-service teachers' self-identification about digital generations align with the digital generations concept?* — we employed quantitative descriptive statistics and we compared quantified open-ended responses from pre-service

and in-service teachers with their birth year intervals to identify the generations they belong. Drawing upon the digital generations concept, pre-service teachers were expected to self-identify as digital natives because they were born in Gen Y and Gen Z cohorts. As seen in Table 1, a total of 50 pre-service teachers identified themselves as digital natives. Of those 50 pre-service teachers, 48 of them were from Gen Z and two of them were from Gen Y by their year of birth. A total of five pre-service teachers identified themselves as digital immigrants. The result that draws our attention is that 13 pre-service teachers who are assigned to Gen Z by their year of birth refrained from providing any self-identification.

Table 1.

Descriptive Findings of Different Generational Cohorts and Self-Definitions (N=111)

	Pre-service Teachers (*n*=68)				**In-service Teachers (*n*=43)**			
Generational Cohorts	**Digital Natives (*n*)**	**Digital Immigrants (*n*)**	**Not sure (*n*)**	**Pre-service Teachers Total**	**Digital Natives (*n*)**	**Digital Immigrants (*n*)**	**Not sure (*n*)**	**In-service Teachers Total**
Baby Boomers (1946-1964)	0	0	0	0	2	3	0	5
Generation X (1965-1980)	0	0	0	0	6	13	3	22
Generation Y (1981- 1996)	2	2	0	4	10	3	1	14
Generation Z (1997-2012)	48	3	13	64	0	0	2	2
Grand Total	50	5	13	68	18	19	6	43

The results showed that in-service teachers were more diverse regarding assigned generational cohorts by year of birth, which could be expected. Their self-identification also showed diverse patterns. Drawing on Prensky's (2001) digital generations concept, in-service teachers in the Baby Boomer generational cohort are expected to be all digital immigrants; however, out of five Baby Boomer in-service teachers, two self-identified as digital natives. Similarly, Gen X in-service teachers were mostly expected to be digital immigrants as they were born before the advent of technology. As expected, 13 of 22 in-service Gen X teachers self-identified as digital immigrants. In the cohort of Gen Y, which is expected to be mostly digital immigrants, 10 out of 14 in-service teachers reported being digital natives. It is important to note that two Gen Z in-service teachers did not provide any self-identification, while they were expected to be digital natives according to Prensky (2001).

To address our first, quantitative research question, we also calculated the total score for each participant, as well as the means and standard deviation of each digital characteristic (i.e., 15-item questionnaire) based on the participants' responses. As shown in Table 2, the results showed that pre-service teachers had higher scores than in-service teachers in *printed reading style*, *online reading style*, and *multitasking* meaning that they had a higher tendency of being most digital. However, in-service teachers reported *managing searching on the web* faster and more efficient than pre-service teachers. The results showed that pre-service teachers reported paying more attention on graphics than text when reading something they find interesting. In-service teachers reported being more digital than pre-service teachers in *using hyperlinks* and *finding question of interest while reading*. The results also showed that

pre-service teachers reported explaining their thoughts in a step-by-step way, whereas in-service teachers reported explaining in the order the ideas and thoughts occur to them. In addition, pre-service teachers reported having *constant contact while reading or learning* and *studying* compared to in-service teachers, whereas the mean score for *learning alone* was found to be the same for both groups. In-service teachers reported using more *independent search* and *completely mixing work and play* compared to pre-service teachers; however, pre-service teachers reported higher *acceptance of short-term boredom* and *learning in game-like settings* when learning something that interest them. Compared to pre-service teachers, in-service teachers reported higher *importance of technology in learning.*

Table 2.

Pre-service and In-service Teachers' Digital Characteristics by Mean and Standard Deviation

	Pre-service Teachers		**In-service Teachers**		**Overall**	
Digital Characteristics	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Overall	**2.66**	**0.37**	**2.62**	**0.45**	**2.64**	**0.40**
Printed reading style	2.22	1.06	1.91	1.13	2.10	1.10
Online reading style	2.63	1.17	2.44	1.12	2.56	1.15
Managing searching on the web	3.06	1.29	3.56	1.16	3.25	1.26
Multitasking	2.41	1.04	2.07	1.14	2.28	1.09
Balancing attention for graphics vs. text	2.84	1.06	2.67	0.97	2.77	1.02
Using Hyperlinks	2.07	1.08	2.37	0.98	2.19	1.05
Finding question of interest while reading	2.94	1.41	3.40	1.25	3.12	1.37
Explaining thoughts	3.06	1.58	2.56	1.61	2.86	1.61
Maintaining contact while reading or learning	2.78	0.77	2.70	0.91	2.75	0.83
Study and learn alone vs with friends	2.28	0.99	2.28	1.16	2.28	1.05
Preference of lecture vs independent search	2.33	1.05	2.72	0.98	2.48	1.04
Defining the relationship between work and play	2.57	1.04	2.67	1.15	2.61	1.08
Attitude about short-term boredom	2.85	1.15	2.35	1.09	2.66	1.15
Learning in game-like settings	2.78	1.01	2.19	1.04	2.55	1.05
The importance of technology in learning	3.04	1.06	3.35	0.97	3.16	1.03

Notes: In the calculation of mean and standard deviation (SD), assigned values: 1=being the most traditional and 5=being the most digital.

Connection from Quantitative Phase to Qualitative Phase

The quantitative results showed that pre-service and in-service participants' self-identification had noteworthy differences from the general age categorization in Prensky's (2001) concept. In addition, their reported digital characteristics were found to be varied. Therefore, the quantitative results called for further exploration of the pre-service and in-service teachers' description of their digital generation positionality, drawing on their digital practices. Based on quantitative findings from the online questionnaire, we employed maximum variation sampling technique to select participants for the second, qualitative interview phase. Maximum variation sampling is used to select different representative cases that helps understanding different aspects of the phenomenon of interest (Teddlie & Yu, 2007). In the context of this study, three pre-service and three in-service teachers (a total of six interviewees) were selected based on their mean questionnaire scores and self-definitions, and they were invited for an interview. Accordingly, we used nested sampling strategy to connect the quantitative and qualitative phases. Nested sampling is a mixed methods sampling strategy that is used when researchers select a sub-sample of one method to collect the other type of data (Collins et al., 2007).

Qualitative Phase: Methods

The aim of the second, qualitative phase was to develop a deeper understanding of how pre-service and in-service teachers described their digital generation positionality, drawing on their digital practices. Therefore, we invited pre-service and in-service teachers who were expected to belong to certain digital generational cohorts, and yet they identified themselves as contrary. In addition, we invited teachers whose self-identification aligned with Prensky's (2001) perspective to see whether their reasons for identifying as such. For the qualitative phase, we invited a total of 12 participants who reported diverse positionalities. A total of six participants volunteered to participate in the interview.

Participants

Three pre-service and three in-service teachers whose assigned generational cohorts were identified as diverse volunteered to be interviewed. Participants are represented with two letters and a number. For example, PS1 represents the first pre-service teacher, whereas IS2 represents the second in-service teacher. As shown in Table 3, among the three in-service teachers, two of them (IS1 and IS3) are Gen Y by their assigned generational cohorts, and these in-service teachers identified themselves as digital natives contrary to the digital generations concept. Both of these in-service teachers (IS1 and IS3) scored above the mean average in the questionnaire. Only one participant (IS2) whose assigned generational age cohort is Baby Boomer self-identified as a digital immigrant, and this in-service teacher had average overall mean score from the questionnaire.

Among the pre-service interviewees, one participant (PS3) who belong to Gen Z by birth self-identified as digital natives, which aligns with Prensky's (2001) concept. The other Gen Z participant (PS2) reported that he did not have any idea about these identifications. The remaining one participant (PS1) among pre-service teachers belongs to Gen Y by year of birth and self-identified as digital immigrant. All pre-service teacher interviewees had average overall mean score from the questionnaire.

Table 3.

Qualitative Interviewees (Pre-service and In-service Teachers) Characteristics (n=6)

Participants	Status	Gender	Generational Cohort	Self-identification	Mean
IS1	In-service Teacher	Male	Gen Y (81-96)	Digital Native	↑ 2.87
IS2	In-service Teacher	Female	Boomer (46-64)	Digital Immigrant	→ 2.60
IS3	In-service Teacher	Female	Gen Y (81-96)	Digital Native	↑ 3.07
PS1	Pre-service Teacher	Female	Gen Y (81-96)	Digital Immigrant	→ 2.33
PS2	Pre-service Teacher	Male	Gen Z (97-12)	No clue	→ 2.33
PS3	Pre-service Teacher	Female	Gen Z (92-12)	Digital Native	→ 2.33

Note: → =At Average; ↑ =Above Average

Data Collection and Analysis

The semi-structured interview protocol included 10 questions with some additional probes to better understand participants' experiences (see **Appendix A**). Two types of data sources were used as the qualitative data in this study: (a) Open-ended questions from the questionnaire and (b) semi-structured interviews. We included three open-ended questions to the questionnaire in order to obtain information about participants' self-definition of sense of belonging. The open-ended questions in the questionnaire were analyzed using thematic analysis (Braun & Clarke, 2006) to examine patterns within the self-definition of participants' sense of belonging.

The first author developed the interview questions based on the findings from the quantitative phase. The second author reviewed the questions, and both authors revised the protocol before the data collection. The interview questions focused on the personal digital literacy practice and each participant's self-definition of a generational sense of belonging. In addition, we aimed to understand participants' coping mechanisms when they were challenged by technology and how this confrontation changed their positionality regarding their digital use. Each interview lasted about 35-45 minutes and was audio-recorded and transcribed verbatim. Qualitative interviews were also analyzed using thematic analysis (Braun & Clarke, 2006) to explore pre-service and in-service teachers' digital practices. Both authors performed line-by-line coding on two transcripts together first, then independently coded the rest of the transcripts. The authors met twice, each lasting approximately two hours. During these sessions, the authors shared new codes and their questions to refine the codebook, followed by discussions to ensure consistency, and address inter-rater reliability. To validate the qualitative data, the first author took extensive notes and reflexive memos throughout the data collection and analysis process. MAXQDA 2022 qualitative and mixed methods research software was used for quantitative, qualitative, and mixed methods integrated analyses (VERBI Software, 2021).

Qualitative Phase: Findings

To address the second research question —*How do pre-service and in-service teachers describe their digital generation positionality drawing on their digital practices?* — we first present our findings from the interviewees' answers to the open-ended questions of self-definition about generational sense of belonging and their reasons in the questionnaire. Then, we present the themes from the interviews to explain the participants' personal digital literacy practices and their self-definition about generational sense of belonging.

Findings from the Open-ended Responses: Participants' Self-definition about Generational Sense of Belonging and Their Reasons

The findings from the open-ended responses showed that not only generational cohorts and self-definitions were different, but also participants' reasoning for their self-definition varied. It is important to note that the positionality difference was not a personal preference for these participants; rather, it was a political stance. For example, for IS1 being a digital native was related to technological "availability" in his daily life, whereas for IS3 being a digital native meant that she grew up at the time

technology evolved. IS3 reported that she identified as a digital native because she grew up "as it [technology] was evolving." IS2 reported a stark difference regarding her positionality and experience with technology. As a Baby Boomer in-service teacher, IS2 explained that she drew on her experience with technology over the course of her profession but focused mostly on "embrac[ing] the change" rather than the "evolving" nature of technology like IS3. Table 4 presents the participants' self-definition about the generational sense of belonging and the reasons for their self-definition.

Table 4.

Participants' Self-definition about Generational Sense of Belonging and Reasons for Their Self-Definition (n=6)

Participants	Self-definition about generational sense of belonging	Reasons for self-definition
IS1	Digital Native	"I capitalize on the technology's availability and use it as much as I can in my day-to-day life."
IS2	Digital Immigrant	"I have released my old mindset about the role of technology in teaching as times and children have changed. When I started teaching, the teacher directed all student learning with some allowance for inquiry. The inquiry was important then, but not technologically driven at that time. The role and the tools of technology in the education of young people has changed frequently and dramatically over the years that I have been teaching. However, because I am an intrinsic lifelong learner, I embrace change."
IS3	Digital Native	"I grew up as it [technology] was evolving."
PS1	Digital Immigrant	"I grew up as technology was emerging, so my childhood was not as technologically involved as kids growing up today."
PS2	No idea	"I have no clue what that means, but I am very comfortable with a computer and using the internet."
PS3	Digital Native	"I was born into the age of technology and have used it my entire life."

Findings from the Interviews: Explanation about Participants' Personal Digital Literacy Practices and Their Self-definition about Generational Sense of Belonging

Pre-service and in-service teachers' interviews provided in-depth explanations and diverse perspectives about their generational positionality and digital use. In this section, the findings from the thematic analysis are organized in three major headings: (a) Material trajectory, (b) positioning through practice, and (c) paradigmatic shift.

Material Trajectory. Material trajectory refers to the participants' self-definitions drawing on the material use of technology. The findings showed that the participants, to a certain degree, appreciated a correspondence between the course of their lives and digital use. For instance, IS3 defined herself as a digital native and reported that she was exposed to technology from an early age. She said, "I've grown with technology from elementary school." Her attention in the rest of the interview was not on the availability or the accessibility of digital devices but rather on the correspondence between her life from early on and digital developments. PS3 shared a similar definition, but she was more reliant on digital use. She stated that technology was something she has always known and an inseparable part of her life and said, "I do not think that I'd be able to navigate my life without it."

Material trajectory emerged in the form of a comparison of some participants' statements. While IS3 and PS3 articulated their digital use as progression, PS1 articulated digital use by comparing her practice with people around her. PS1 stated that her digital use from her younger ages could not be comparable to today's world's young kids of various ages that she babysat. PS1 reported that she was "not reliant on technology as other people," and she emphasized the importance of human relationships rather than online interaction. PS1 shared that technology could be used as long as it improved human relationships for her. Similar to PS1, IS2 reported that there should be a human being for students to help them, and only a human teacher could build relationships to help students. IS2 further discussed the human component of teaching and concluded that her understanding of teaching shifted through technology. As one of the most experienced teachers among the interviewees, IS2 reported that she previously thought that teachers were "the purveyor of the knowledge;" however, she then realized that she needed to be helping students find the true information through technology. As IS2 described, this switch caused a "steep learning curve" for her as she struggled with intense digital use during the pandemic. The "steep learning curve" may explain the challenge for IS2 to develop new literacies practices. Overall, the findings about *material trajectory* in participants' self-definitions may signal convergence culture from multiple dimensions, including developing new literacies practices upon challenge and the manifestation of participatory culture in the form of new literacies.

Positioning Through Practice. Positioning through practice means the positionality of participants regarding their practice. Participants tied their material trajectory to their digital practices and positioned themselves at various points of the generational spectrum. Their statements from the interviews showed that a short self-definition does not suffice understanding participants' positionality deeply. Participants compared their practices, digital or non-digital, to clarify their self-definition and depict their positionality. For instance, PS3 described herself in the use of navigation devices and printed maps. She said, "I know certain people would still use printed-out like MapQuest." Similarly, PS1 described her degree of technology use and focused on having a balanced perspective. She said, "It [technology use] does not have to be 24/7. It does not have to be every single thing is on it, but it is helpful. But then it, if it does not work, you are stuck." PS1 further explained her comparison of self to other people who belong to other generational cohorts. She associated the most prominent generational divide with her experience. PS1 considered that "older people who do not use technology" might consider younger people more technology savvy. This perspective was common among pre-service teachers in the qualitative sample. PS1 exemplified this perspective by mentioning her first contact with technology. She stated that she got an iPad from school when she was in 11th grade and said, "that was the first time I had ever had one of them for school. And so, everything started being on there." With this passive positionality, as PS1 was exposed to technology, she positioned herself as a digital immigrant.

IS2 had a different perspective when she was positioning herself within the generational spectrum. She defined herself as a digital immigrant, but her description of practice seemed quite similar

to natives. IS2 explained and said, "Because there were some younger teachers at school that were using technology before all of this happened who were using it a lot more during their actual teaching than I was." Her observation of younger teachers amazed her but did not restrict her from learning and adopting technology and she said, "Oh wow, look at what they are able to do. And I probably could have done it."

IS3 positioned herself as a mentor to digital immigrants around her. She reported an example of her father, who was also a teacher at the time of the pandemic. She said, "it takes him so much longer to learn the technology… but we walk through it together. He writes down on paper all that steps of the technology." As IS3 reported, her mentorship in digital interaction was not only in the relationship with her father but also with her students' parents, as she reported a similar type of support she offered to the parents in her school.

Findings about *positioning through practice* referred to media convergence within the convergence culture framework. On the one hand, the participants' practices, as well as their position within the digital generation cohorts, changed. On the other hand, IS3's practice with her dad was an example of collective intelligence within the framework, which is interwoven with new literacy practices as her father "wrote down" every step of the required digital work, he had developed new literacy practices.

Paradigmatic Shift. Pre-service and in-service teachers in this study reported that they were aware of a paradigmatic shift that affected their profession and use of technology. As the participants described, the traditional place of teachers, instruction, and appropriate material use in teaching have been shifted towards more digital. However, not every digital device was considered educational by the participants. For instance, IS1 reported that he was criticized because he used her phone for educational purposes. He underlined that being on a laptop was considered as doing something important while being on the phone is considered trifling, although he was able to accomplish important tasks for his job on the phone, such as taking notes and keeping up with a class. He further explained the paradigmatic shift and said, "It is not something that we should resist." He emphasized that people who criticized him or were opposed to the use of technology did not understand the shift. He said,

> It is you against the world, isn't it? Yeah, it is you against a whole paradigm shift. And that's the battle that we currently fight because, on the one hand, you want to say to the child, for the phone up, because you, again, your first thought is that it is a distraction.

According to IS1, the paradigm shift would continue, and those who went against it would not be able to keep up with their own perspective.

While the paradigmatic shift emerged as a motivational stance in IS1's practices, it emerged differently in IS2. IS2 experienced a shift in her central role as a teacher. She reported that she previously considered computers as "clerical stuff" in her in-classroom practices However, with this paradigm shift, she needed to open a space for young children who were good at technology, and she did that without any discomfort. It even helped her improve her relationship with her students. She said, "Well, I take

advantage of it every day. There's one little boy in my class, and if something does not go right, I will say, [student name], can you come over here and show me this?"

While the paradigmatic shift IS1 and IS2 reported was in their personal life, IS3 reported a similar shift in the lives of students' parents. Given that parents needed to communicate with teachers at some point via technology, this digital paradigm challenged the parents differently. While some parents adopted the apps and used them for communication, some parents kept saying, "just call me." As a teacher who was fond of emails as a means of communication with parents, IS3 was also challenged by different requests from the parents.

PS1 explained a paradigm shift in her life through another cultural concept called "the third culture kid." She said, "Different people who do everything in a different way is always really hard to identify with one culture or one idea." For PS1, she was also a digital third culture kid as she identified herself as a digital immigrant, but she reported that there were people who considered her as a digital native. Because she felt like an outsider to digital culture, she explained her point by stating how old she was when she began to use technology and said, "I think in 11th grade, I got an iPad from the school. And everything started being on there." According to her, 11th grade was too late to be a digital native. Different than PS1, PS2 was aware of the shift, but he focused more on the struggling part of the technology. He said, "I'm having to adjust. But it is still a struggle." Similarly, PS3 observed the struggle of her professors in digital use. She further underlined that she might become one of the "not very technologically savvy" professors, and she found the solution in collaboration and said, "I'll just have to learn from my students and have them help me out." Overall, the findings about *paradigmatic shift* may be explained by the pertinence of convergence culture. IS1's statements about a paradigm shift and his criticism about reactions to digital use exemplified how convergence culture is prominent and how teachers were pioneering it. More importantly, he challenged the inured perspective about mobile phones and laptops by conducting his tasks on the phone. From this perspective, a new literacies perspective may be manifested through his cell phone use for professional purposes.

Integration Techniques and Integrated Results

To address our third, mixed methods research question —*How do age cohort and pre-service and in-service teachers' self-identification about digital generations explain participants' digital characteristic?* — we employed narrative and joint display techniques to present the integrated findings by bringing quantitative results and qualitative themes together. Joint displays are visual tools that are used to present integrated findings in mixed-methods research studies (Fetters et al., 2013). The narrative technique is an approach to explaining the connections between qualitative and quantitative findings thematically (Fetters et al., 2013).

The profiles of in-service teachers, who participated in the interviews, were different than the pre-service teachers. The questionnaire results showed that two in-service teachers scored above the average (M=2.64, SD=0.40), whereas only one in-service teacher's score was at the average. Accordingly, in-service teachers who defined themselves as digital natives were found to be the ones

that scored above the average. The digital immigrant in-service teacher was the one that scored at the average. IS1, a self-defined digital native, noted that he turned intense exposure into an advantage for him by using the fast availability of technology. He also stated the "paradigm shift" in today's society and underlined the "adoptability" of technology. IS2, a self-defined digital immigrant, emphasized the shift in her mindset. As IS2 noted, the technology was for "clerical stuff" in her teaching before intense digital exposure. She stated, however, she realized that it could be used for "purveyor" of the knowledge. IS3, a self-defined digital native, noted monitoring her convergence from her childhood along with technological developments. As she described, the change in technology and in her teaching due to intense digital exposure was very fast but she insisted keeping up with this convergence.

The quantitative results showed that the pre-service teachers, who also participated in the interview, scored at the average (M=2.64, SD=0.40). However, they all had different explanations for intense digital exposure. PS1 saw the bright side of intense exposure and stated that she became more organized because she used technology more. As a self-defined digital immigrant, PS1 also asserted that she got used to the challenges of technology and the change for her remained constant. PS2 stated that intense digital exposure was a struggle, and he was adjusting. We found the same uncertainty in his reaction to digital exposure in his self-definition as PS2 said, "I have no clue what that [digital generations] means, but I am very comfortable with technology." PS3, a self-defined digital native, reported a major increase in her digital practice. Table 5 is the joint display that depicts the integrated findings and presents mixed methods interpretations.

Table 5.

Joint Display of Integrated Findings about Pre-service and In-service teachers' Self-identification about Digital Generations

Participant	Quantitative Results	Qualitative Findings	Mixed Methods Interpretation
IS1	2.87 ↑	Turned intense exposure into an advantage. "Paradigm shift" in society and "adoptability" matters.	His mean score and interview indicated a strong and welcomed changed in his digital practice.
IS2	2.60 →	Convergence in her mindset. The role of technology changed in her teaching. She challenged the challenges.	She depicted a willing convergence; however, she was hesitant to define herself as digital native. Her convergence was a challenge in her profession.
IS3	3.07 ↑	Technological trajectory beginning from childhood. Keeping up with convergence in her teaching.	Her mean score and interview showed that she was aware and embraced the convergence.
PS1	2.33 →	She became more organized and got used to the challenge. Convergence continued for her.	Her mean score showed that she was close to change. Her interview indicated that she had already begun and accepted the change.
PS2	2.33 →	Digital exposure was a struggle, and he was still adjusting.	His mean score showed that he was close to change. However, his interview showed that he had an uncertainty about this change.

PS3	2.33 ➡	Experienced a major increase in digital practice and enjoyed technology in her daily life. But she was very tired of Zoom.	She already adopted the digital change. She was also aware the difference between her and others who were not changed.

Discussion

The purpose of this mixed methods study was to capture pre-service and in-service teachers' self-definitions of digital generations and the change in these definitions based on their digital practices. Our study has shown that participants' positionalities regarding assigned and defined generational belonging have contrasting and overlapping areas with Prensky's (2001) concept. While some participants reported digital practice as it would be expected in Prensky's (2001) concept, many other participants reported contradicting digital practices and positionalities, which created a paradox among generational cohorts. The paradox here emerged through highly personalized and customized digital practice, which does not make it possible to reach a general categorization among age groups. The paradox, however, revealed various new literacies practices that pre-service and in-service teachers adopted, employed, and executed when they were challenged by extensive digital exposure.

Similar overlapping and contradicting practices that were reported in this study have already been documented by Thompson (2013) when she challenged the popular digital native discussion. Because the empirical base of the digital generations concept is weak (Buckingham, 2006; Bennett et al., 2008; Smith, 2012), it is expected that a non-empirical-based proposal regarding digital generations should die out (Judd, 2018). However, the digital generation concept has gotten stronger rather than weaker. Even further, anecdotally, we observed that the digital generations concept had become a stereotypical perspective that categorizes and discriminates against pre-service and in-service teachers. Smith and her colleagues (2020) proposed a more inclusive approach and focused on integrating digital practice into professional education. However, the recent COVID-19 pandemic has drastically affected the educational technology domain, so that it required a brand-new perspective.

It is not easy to provide definitive borders among generations, as there will always be blending and mixing practices. Upon the recent intense digital exposure on pre-service and in-service teachers due to the pandemic, we provided empirical evidence for a convergence nature of the digital practice, which interferes with teachers' self-conceptions. In this study, the pre-service and in-service teachers reported that their personal practices had changed along with their mindset. During this convergence, they developed new coping mechanisms or alternative positionalities for their digital practice.

Our study diverges from previous studies in another important point. As Prensky's (2001) concept did not have any empirical base, it seems easy to categorize generations. However, we could not locate any previous studies that invited pre-service and in-service teachers to define themselves rather than putting them into categories. More importantly, at the time this study was conducted, four generational cohorts were working in the same workplaces (Meister & Willyerd, 2010). As they went under intense digital exposure as a cluster of colleagues, a holistic approach was required to understand their positionalities. With this study, we could explain pre-service and in-service teachers' self-

identification, reasons for identification, and practices and address this gap in the literature. The inclusive perspective we adopted in this study revealed a blended picture of teachers' perceptions of technology. Some reasons for self-identification, such as setting a beginning time with an iPad, showed us that participants considered a close connection between their positionality and digital devices (Fernandez-de-Arroyabe-Olaortua et al., 2018). This result is not surprising given that Prensky's (2001) digital generations concept has been around for more than two decades.

The close connection between digital materials and participants' positionality signaled an inertia that was inherited within educational society. As educators have been categorized by their assigned generation regarding their digital use for a long time, they might have adopted categories. However, some reasons participants provided the pioneering position of the teachers. For instance, when an in-service teacher who was expected to be a digital immigrant by birth questioned the criticism about digital use in the classroom and addressed the paradigm shift, he manifested that teachers cannot be contained in their assigned generational cohorts. This result explains that practices can help individuals challenge the stereotypes and pioneer the paradigmatic shift instead of accepting the predetermined positionality.

Implications

This study has several implications for the fields of digital literacy and education. First, the digital generations paradox is explained by the pre-service and in-service teachers' reasons that were discordant with the common perception. Although previous studies about digital natives focused on young people's digital practices, this study emphasized that digital immigrants may experience digital literacies in similar ways to digital natives. Therefore, the different positionalities that were encompassed in this study provide an inclusive picture regarding pre-service and in-service teachers' digital practices.

Second, the practices documented in this study were hard to categorize, which led us to think about paradoxical interaction. Although there are only two main positionalities (i.e., digital native or digital immigrant), participants' reasons for taking a particular positionality were highly personalized and fractured. At this point, we turned our gaze to the center of the paradox and began the question the generational divisions. We understood that focusing on the assigned generational cohorts and pre-determined categories regarding pre-service and in-service teachers' digital practices was not enough in explaining discordancy. Therefore, we underlined in this study that we should conceive the assigned birth groups and their digital practices as a spectrum. Instead of putting teachers in pre-determined categories, we offer researchers to consider age cohorts as a spectrum of human practices that can change by interacting with others. For these reasons, future research may focus on examining pre-service and in-service teachers' digital practices within a single frame of study, as interaction among different age cohorts may lead to different results.

Limitations

The results of this study should be interpreted with the consideration of four limitations. First, we purposefully selected pre-service and in-service teachers to better understand their self-definitions

of digital generations based on their age cohorts and conducted the data collection at the time of the COVID-19 pandemic, when pre-service and in-service teachers were forced to use technology extensively. Because of the sample selection and timing of the data collection, our findings should be interpreted with caution. Second, we used a modified version of the Digital Characteristic Scale developed by Thompson (2013) and only administered the first part of the scale (i.e., digital characteristics) as an online questionnaire, although the scale has two components. Our intent in using this modified version was to ease the potential burden on the participants, given that the COVID-19 pandemic brought a lot of unprecedented demands for both pre-service and in-service teachers. Third, we aimed to use maximum variation sampling strategies to explain the variation among the pre-service and in-service teachers and their definitions and practices of digital generations qualitatively. However, all of our pre-service teachers who participated in the qualitative phase had the average score, whereas our in-service teacher interviewees scored above the average and at average. Therefore, our study is limited in explaining pre-service and in-service teachers' digital generation practices for those who scored below the average. Fourth, we did not collect any demographics information about our participants, given that the concept of digital generations is controversial and stereotypical in a way that could lead to discrimination for the race, ethnicity, and gender among the many other characteristics of our participants when interpreting the quantitative results. Yet, we included the gender characteristics of our interviewees to explain the contextual meaning of their experiences to further describe the stereotypes.

Conclusion

This study contributes to the fields of digital literacy and education by providing in-depth knowledge about how technological integration can play a role in stereotypical concepts in education and by raising educators' voices to describe their sense of belonging about digital generations. It contributes to the digital literacy practices research by showing the overlooked effect of literacy to unify and value different perspectives and positionalities. Instead of using technology to categorize educators and letting the technology exacerbate the discrimination in education, as the authors, we appreciate diverse profiles of educators under intense technological exposure and change. We hope that this work further expands the discussion on how to use technology to provide a collaborative and cooperative venue in the fields of digital literacy and education.

Contribution Statement/ Araştırmacıların Katkı Oranı

All researchers contributed equally to the study/ Çalışmaya tüm araştırmacılar eşit oranda katkı sağlamıştır.

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Declaration of Competing Interest/ Çatışma Beyanı

There is no conflict of interest. / Çıkar çatışması bulunmamaktadır.

Ethics Committee Approval/ Etik Onay

The study was approved by the Institutional Review Board (IRB) of both authors' affiliate institutions. The second author was affiliated with the University of Cincinnati at the time of the data collection and analysis. / Çalışma, her iki yazarın bağlı kuruluşlarının Kurumsal İnceleme Kurulu tarafından onaylanmıştır. İkinci yazar, veri toplama ve analiz sırasında Cincinnati Üniversitesi'nde görev yapıyordu.

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Appendix A. The semi-structured interview protocol

Due to the nature of the qualitative research, some of the questions varied depending on the participants' survey results.

1. You defined yourself as a _____ because _____. Can you elaborate more on this definition?
2. You reported in the survey that technology is _____ part of your life. This might interfere with engaging educational activities during pandemic. Can you elaborate more on this?
3. You reported that your reading style _____. Can you compare your reading performance when you read online and printed?
4. How do you think the reason you stated previously contradicts with your self-definition of digital native?
5. How do you describe your overall digital engagement during pandemic?
6. As you can guess digital immigrant is a name for the people who adopt technology later in their life. These people are assumed that they are not fully comfortable in their digital engagement. Do you observe this kind of people around you? Your students, classmates, co-workers, administrative people? How do you describe your interaction with them?
7. How have you felt about being a digital ____? Have you ever been criticized because of your digital engagement?
8. Your colleagues and administrative staff might define themselves differently than you do. How do you think this will influence your teaching, especially in the future?
9. What else should I know about your experience?

Appendix B. Ethics Committee Approval

UNIVERSITY OF
SOUTH CAROLINA

OFFICE OF RESEARCH COMPLIANCE

INSTITUTIONAL REVIEW BOARD FOR HUMAN RESEARCH
APPROVAL LETTER for EXEMPT REVIEW

Asiye Demir
1100 Wheat Street
Columbia, SC 29201 USA

Re: **Pro00104763**

Dear Asiye Demir:

This is to certify that the research study ***Exploring Digital Generations Paradox in Pre- and In-service Teachers' Reading Practices. A Mixed-method Study*** was reviewed in accordance with 45 CFR 46.104(d)(2) and 45 CFR 46.111(a)(7), the study received an exemption from Human Research Subject Regulations on **10/13/2020**. No further action or Institutional Review Board (IRB) oversight is required, as long as the study remains the same. However, the Principal Investigator must inform the Office of Research Compliance of any changes in procedures involving human subjects. Changes to the current research study could result in a reclassification of the study and further review by the IRB.

Because this study was determined to be exempt from further IRB oversight, consent document(s), if applicable, are not stamped with an expiration date.

All research related records are to be retained for at least three (3) years after termination of the study.

The Office of Research Compliance is an administrative office that supports the University of South Carolina Institutional Review Board (USC IRB). If you have questions, contact Lisa Johnson at lisaj@mailbox.sc.edu or (803) 777-6670.

Sincerely,

Lisa M. Johnson
ORC Assistant Director and IRB Manager