Canadian Journal of Learning and Technology
Revue canadienne de l'apprentissage et de la technologie

Digital Competence in Primary Education and the Limits of 1:1 Computing
La compétence numérique à l'école primaire et les limites de l'informatique 1:1

Fernando Fraga-Varela et Almudena Alonso-Ferreiro

Volume 48, numéro 2, été 2022

URI : https://id.erudit.org/iderudit/1097180ar
DOI : https://doi.org/10.21432/cjlt27955

Aller au sommaire du numéro

Éditeur(s)

The Canadian Network for Innovation in Education

ISSN

1499-6677 (imprimé)
1499-6685 (numérique)

Découvrir la revue

Citer cet article

Fraga-Varela, F. & Alonso-Ferreiro, A. (2022). Digital Competence in Primary Education and the Limits of 1:1 Computing. *Canadian Journal of Learning and Technology / Revue canadienne de l'apprentissage et de la technologie*, *48*(2), 1–18. https://doi.org/10.21432/cjlt27955

Résumé de l'article

Près d'une décennie après l'incorporation massive de la technologie dans les écoles de Galice, en Espagne, basée sur des programmes informatiques individualisés (1:1), où les enseignants et les élèves ont accès à des ordinateurs portables, cette étude a exploré les effets de la technologie sur la vie des enfants en situation d'exclusion socioculturelle et économique. Trois études de cas ont été sélectionnées à partir de deux projets de recherche. Chaque étude de cas représente trois individus. Ces études ont été analysées par une approche ethnographique utilisant des entretiens approfondis et l'observation des participants. La méthode comparative constante a été utilisée, soutenue par le logiciel d'analyse qualitative ATLAS.ti 7. Les politiques individualisés (1:1) excluaient le contexte familial et le développement de la compétence numérique dépendait fortement des possibilités offertes à l'école. Les résultats indiquent que ces politiques n'ont pas réduit les inégalités car les expériences d'apprentissage avancées avec les technologies de l'information et de la communication n'étaient pas proposées à l'école.

CJLT RCAT
Canadian Journal of Learning and Technology
La Revue canadienne de l'apprentissage et de la technologie

Volume 48 (2) Summer/été 2022

Digital Competence in Primary Education and the Limits of 1:1 Computing

La compétence numérique à l'école primaire et les limites de l'informatique 1:1

Fernando Fraga-Varela, *University of Santiago de Compostela, Spain*

Almudena Alonso-Ferreiro, *University of Vigo, Spain*

Abstract

Almost a decade after the massive incorporation of technology into schools in Galicia, Spain based on 1:1 computing programs, where teachers and students have access to laptop computers, this study explored the effects of technology on the lives of children in situations of socio-cultural and economic exclusion. Three case studies were selected from two research projects. Each case study representing three individuals. These studies were analyzed through an ethnographic approach using in-depth interviews and participant observation. The constant comparative method was used, supported by ATLAS.ti 7 qualitative analysis software. The 1:1 policies excluded the family context and the development of digital competence was heavily dependent on the opportunities provided at school. The results indicated that these policies did not reduce inequality because advanced learning experiences with information and communication technology were not provided at school.

Keywords: Digital competence; Digital literacy; Primary education; Exclusion; 1:1 computing

Résumé

Près d'une décennie après l'incorporation massive de la technologie dans les écoles de Galice, en Espagne, basée sur des programmes informatiques individualisés (1:1), où les enseignants et les élèves ont accès à des ordinateurs portables, cette étude a exploré les effets de la technologie sur la vie des enfants en situation d'exclusion socioculturelle et économique. Trois études de cas ont été sélectionnées à partir de deux projets de recherche. Chaque étude de cas représente trois individus. Ces études ont été analysées par une approche ethnographique utilisant des entretiens approfondis et l'observation des participants. La méthode comparative constante a été utilisée, soutenue par le logiciel d'analyse qualitative ATLAS.ti 7. Les politiques individualisés (1:1) excluaient le contexte familial et le développement de la compétence numérique dépendait fortement des possibilités offertes à l'école. Les résultats indiquent que ces politiques n'ont pas réduit les inégalités car les expériences

d'apprentissage avancées avec les technologies de l'information et de la communication n'étaient pas proposées à l'école.

Mots-clés : Compétence numérique ; Alphabétisation numérique ; Enseignement primaire ; Exclusion ; Informatique individualisée 1:1

Introduction

Digital technologies have become essential resources in the digital era. In this context, there is a clear and urgent need to train citizens for a digital environment. This means learning to consume and to produce media message, creating and expressing yourself with digital technology, and knowing how to act in the digital sphere.

In recent years, the European Union (EU) has advanced in defining digital literacy as an element for the convergence of different literacies, such as information technology literacy, information literacy, technological literacy, media literacy, and visual literacy (Martin, 2006). Some of these, including technological literacy (Martin, 2008; Martin & Grudziecki, 2006) have a long tradition, which has been reinforced in the current digital context with supportive elements that provide a current and valid frame of reference (Breuch, 2002). European Union educational systems require digital competency training for students. Progress has been made to concisely define digital competence via frameworks such as The Digital Competence Framework for Citizenship (Ferrari, 2013) and its updated version the DigComp 2.2 (Vuorikari et al., 2022); a specific version of digital competence for educational environments called DigcompEdu (Redecker & Punie, 2017); and another version specially designed for organizations called DigCompOrg (Kampylis et al., 2015), which has generated the Self-reflection on Effective Learning by Fostering the use of Innovative Educational (SELFIE) technologies project for the evaluation of educational institutions. This project has yielded specific data (Castaño-Muñoz et al., 2021). Other frameworks fall under the umbrella of DigComp, including the Life Comp (Sala et al., 2020) which focused on key competences for lifelong learning. The use of competence concepts, specifically digital competence, has provided a common language and structure for EU education systems. This framework has been explicitly included in the latest school regulations for primary education in Spain (Organic Law 2/2020 of Education, 2020). Following the Council Recommendation of 22 May 2018 on key competences for lifelong learning, an updated version of the recommendation of the European Parliament and of the Council of 18 December 2006 (European Commission, 2006), digital competence was defined as:

> the confident and critical use of Information Society Technology (IST) for work, leisure, and communication. It is underpinned by basic skills in ICT: the use of computers to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet. (European Commission, 2018a, p. 6)

Learning digital competence has become fundamental for 21st century citizens. It is vital for full, active, democratic, free, responsible, and critical participation in society. From a social justice

perspective and because of their transformative power (Fullan, 2001), schools have become privileged places for the integration of digital media (Selwyn, 2011). This knowledge has become an indispensable element of social inclusion for students and their families, and it is for this reason that 1:1 computing programs were implemented for the development of digital competence.

The 1:1 Model in Galicia (Spain): The Abalar and E-Dixgal Project

The Abalar Project, which began in 2010, promoted 1:1 policies in Galicia, Spain focusing on four issues: 1) equipment and infrastructures, ensuring the generation of digital educational centres; 2) digital educational contents and resources with new educational models and improvement of educational practices collaboratively with teaching staff; 3) promotion of digital culture by both teachers and families; and 4) creation of collaborative digital spaces for teachers, students, and families (Xunta de Galicia, 2010). In order to promote these changes, teachers with special roles were selected to invigorate educational and methodological innovation in educational centres, implementing a training proposal for teachers at the coordinator level in educational centres and of a pedagogical nature for the other participating teachers (AMTEGA, 2013). It prioritized the allocation of teachers to schools based on teacher's interest (Order of June 28, 2010).

The Abalar Project began by distributing one computer per student in the participating classrooms as follows: Grade 5 and 6 of primary school and the first and second year of compulsory secondary education at selected schools (1000 schools participating but only 514 schools received the first computers installment). Unlike the One-Laptop-Per-Child project in Galicia, which was clearly an inspiration in the pursuit of equity, inclusion, and equality, laptops were only distributed in those schools participating in the project and their use was allowed only at the school. From the outset, this was problematic in terms of family involvement in the 1:1 model, a fundamental dimension that, as research shows, has been neglected (San Martín et al., 2014).

In 2014, a second phase was launched, the E-DIXGAL Project, which focused on the implementation of digital textbooks in the classrooms that were already part of the Abalar Project. The change permitted working with the equipment at home, which provided continuity for what was done in the classrooms (Valiente, 2011). This second phase consisted of 267 of the 514 schools in the Abalar Project. Thus, there were three different levels in Galician public schools: those that were not included in 1:1 policies, those in the Abalar Project, and those in the Abalar-E-DIXGAL program (Fraga-Varela & Alonso-Fereiro, 2016).

Research on the Abalar and E-DIXGAL projects showed that they mainly focused on the provision of equipment, without concrete actions or proposals for contributing to changes in teaching practices and methodologies (Area, 2011; Dussel, 2017; Fraga-Varela & Alonso-Ferreiro, 2016; Selwyn & Facer, 2013). A lack of administrative support characterized both projects (Alonso-Ferreiro & Gewerc, 2015). Some studies pointed to factors such as the lack of specific training on issues associated with digital competence in curricula, in contrast to traditional knowledge areas (Howard et al., 2015) or the fact that standardized external evaluation tests fail to include these digital competencies because value is placed on other skills (Blau et al., 2016). Interestingly, a study that

evaluated digital competence, and not self-perception, confirmed the low levels of development of this competence in primary education (Fraga-Varela et al., 2020), which was clearly in line with previous studies (Aesaert et al., 2015).

Digital Citizenship: Digital Competence as a Path to e-Inclusion

Approaching the study of digital competence as a matter of inclusion requires doing so from the perspective of the digital divide, which views literacy as a process that aims to achieve active democracy, participation, and citizenship (Gewerc & Armando, 2016), stressing access and participation gaps, and questioning digital nativity. Van Dijk & van Deursen (2014) pointed to digital skills as the key to living in the information society and the differences in the development of these skills as one of the main causes of current social gaps.

Digital competence is transformative and disruptive in the current era (Selwyn, 2014), including aspects of exclusion and inequality. It goes beyond merely technological issues (van Dijk, 2005). As a result, the EU DigComp Framework considered this competence to be key for inclusion in the digital society (Ferrari, 2013; Vuorikari et al., 2022). The project established five areas with 21 competencies (Table 1) and 8 levels of proficiency. In addition, it highlighted the importance of digital competence for everyday life and as an element of inclusion, warning that its absence can exacerbate the condition of disadvantaged people and further exclude them socially.

Proposals for 1:1 computing helped reduce the access barrier but second-order barriers, like teachers' pedagogical beliefs (Ertmer, 2005), involving the use of digital resources were spreading and deepening (van Dijk, 2005). This was mainly due to differences in economic, cultural, and social opportunities as well as family variables (Selwyn & Facer, 2007). In this context, promoting digital competence in schools is essential (Selwyn, 2004; van Dijk, 2005; van Dijk & van Deursen, 2014), without losing sight of the family as a privileged educational setting (Bourdieu, 2008).

Digital competence emerges as one of the key elements of schooling in the 21st century (Selwyn & Husen, 2010). In this regard, the 2021 Digital Economy and Society Index (DESI) data indicated that 44% of the population in the EU lacked basic digital skills, with an improvement of only 1% in two years (European Commission, 2021). The recent COVID-19 lockdown exacerbated the inequalities resulting from the lack of available equipment, the lack of family and caregiver support, and unequal levels of digital competence, among others, which remain low among students excluding them from distance learning without the support of their families (Carretero et al., 2021).

With respect to exclusion, cultural capital is an important aspect of scholastic success (Bourdieu, 2008). In this sense, Aesaert et al. (2015) indicated several factors within the educational context as fundamental for the development of digital competence; however, they noted the greater impact of factors having to do with personal and family aspects, unrelated to the school setting. These authors mentioned issues such as experiences with information and communication technology (ICT), their use outside of school, availability at home, parental support, and attitude towards these technologies as conditioning factors for developing digital competence. Moreover, a variety of researchers maintain the existence of a relation between socioeconomic status and the opportunity to

develop digital competence (Aesaert et al., 2015; Claro et al., 2012; Selwyn & Husen, 2010; Vekiri, 2010; Zhong, 2011).

Table 1

DigComp 2.2 Areas and Competences (Vuorikari et al., 2022)

Competence areas	**Competencies**
Information and data literacy	1. Browsing, searching, and filtering data, information, and digital content 2. Evaluating data, information, and digital content 3. Managing data, information, and digital content
Communication and collaboration	1. Interacting through digital technologies 2. Sharing through digital technologies 3. Engaging in citizenship through digital technologies 4. Collaborating through digital technologies 5. Netiquette 6. Managing digital identity
Digital content creation	1. Developing digital content 2. Integrating and re-elaborating digital content 3. Copyright and licenses 4. Programming
Safety	1. Protecting devices 2. Protecting personal data and privacy 3. Protecting health and well-being 4. Protecting the environment
Problem solving	1. Solving technical problems 2. Identifying needs and technological responses 3. Creatively using digital technologies 4. Identifying digital competence gaps

As recently as 2020, the EU boosted policies with its Digital Education Action Plan (2021-2027) at the core of which are the needs exposed by the COVID-19 by establishing two basic principles (European Commission, 2020a): fostering the development of a high-performing digital education ecosystem (strategic priority 1) and enhancing digital skills and competences for the digital transformation (strategic priority 2). Additionally, the Skills Agenda for Europe in July 2020 aimed at helping individuals and companies develop better skills (European Commission, 2020b). This strategy is part of a set of 12 flagship actions that seek to reach and train 60% of the adult population by 2030.

In this regard, acknowledgement is made of the need to update the Digital Competence Framework in 2022 with DigComp 2.2 (Vuorikari et al., 2022). This work contributed to a common approach to digital skills, digital upskilling, and the assessment and framing of policies.

The massive introduction of technological equipment into schools under the 1:1 model has led to an interest in understanding how this type of school policy affects the development of digital competence. There is concern for children from disadvantaged backgrounds who have little opportunity outside of the school institution. This study answers these questions: What is currently happening at school, after almost a decade of massive integration of digital technologies under 1:1 computing programs? How has this contributed to the development of digital competency among young people lacking opportunities outside the educational context?

Methodology

To answer the research questions, we analyzed three cases of primary age students from two recent studies carried out within the Stellae Research Group of the University of Santiago de Compostela. Both studies used a methodological design focusing on multiple-case studies (Yin, 2017) with an ethnographic perspective (Simons, 2009) involving primary school students enrolled in 1:1 computing programs. This approach coincided with what Coller (2005) called a multiple analytical case study, which provided a better understanding of the problem from multi-sited perspective (Rockwell, 2008). In terms of access to students, a sampling of maximum theoretical return (Stake, 1995) was used for the selection of cases. The following pseudonyms were used for anonymity: Arthur, Benjamin, and Jack (Table 2).

Table 2

Characteristics of the Subjects that Make up the Sample

Case	Grade	Family situation	Limitations	Area
Arthur	Grade 5	Parents are separated A younger sister Retired grandfather, only source of income	Repeats a grade 3 hours/week with therapeutic pedagogy teacher	Semi-rural Family home
Benjamin	Grade 6	Lives with his grandparents and his sisters Grandmother has some cleaning jobs, the only source of income	Curricular adaptation	Semi-urban

Case	Grade	Family situation	Limitations	Area
Jack	Grade 6	Only child	Repeated a grade	Urban
		Unemployed father, gamer	ADHD	
		Mother has a cleaning job, the only source of income		

Both reference studies used in-depth interviews with key informants and participant observation for data collection (Table 3). The information was registered in field diaries, video, and audio recordings.

Table 3

Data Collection Techniques in Each Case

	In-depth Interviews	Classroom Observation
Arthur	1 interview with his tutor	Observation for three months
Benjamin	3 interviews with Benjamin	3 visits to the centre
	2 interviews with his grandmother	
	1 interview with his tutor	
Jack	3 interviews with Jack	3 visits to the centre
	2 interviews with his mother	
	1 interview with his tutor	

The children, their tutors, and their families were interviewed. The resulting data were analyzed with the constant comparative method (Glaser & Strauss, 1967) by means of an inductive and sequential categorization (Muñoz & Sahagún, 2010). Field observation notes and interviews were transcribed for analysis using ATLAS.ti software following the proposal by Miles and Huberman (1994), which indicates data reduction, data display, drawing, and verifying conclusions. The first two steps involved coding and documenting, followed later by abstracting and comparing. We looked for regularities and concept development by applying alternative strategies during the inductive and deductive data analysis. Subsequently, interpretative hypotheses were made.

Citation codes were used for direct quotes from interview transcripts and field notes. The codes referred to pseudonyms (Ja = Jack, Ar = Arthur, and Be = Benjamin). Also indicated were the data collection source (I = interview and O = Observation), the person interviewed (T = Teacher, P = Principal, F = Father, M = Mother and G = Grandmother), and the interview/observation number. Lastly, the transcript paragraph number was added to the ATLAS.ti file.

Results

Although Jack, Benjamin, and Arthur had their own peculiarities, there was a common denominator indicating that they could be analyzed jointly. All three cases involved boys enrolled in compulsory primary education in Spain consisting of six grades for ages 6-12. Our subjects were at the end of this education stage. Jack and Benjamin were in Grade 6 and Arthur was in Grade 5. All were at schools with extensive implementation of technological equipment under the 1:1 model. All three cases also presented clear socioeconomic difficulties within the family and an evident risk of exclusion.

Specific factors informed the peculiarities of each case. Jack was exactly 12 years old and had repeated Grade 4. In general, he struggled with the core subjects such as mathematics and Spanish. He was diagnosed with attention deficit hyperactivity disorder (ADHD) and had been prescribed daily medication since the age of 9. According to his family, in addition to these difficulties, the child had low self-esteem and a high degree of immaturity "he is very childish and very immature" (Ja_I_M2_143). However, Jack's attitude problem was seen differently from the school's standpoint, highlighting his "*bad boy*" role, as reported by his tutor: "[teacher talking like Jack] well I don't work, I dedicate myself to other things, ok? Well, I tease and laugh at my classmates, because I'm going to be superior…" (Ja_I_T1_30). As emerged from his family's comments, this attitude was a source of conflict in his social relationships with peers because it led to restless attitudes. His mother indicated, "I don't like him to go to anyone's house because Jack is a child that you have to ... how can I say this... he needs supervision. He is a very restless child" (Ja_I_M2_177-179).

Benjamin was also in Grade 6, having previously stayed back a year. After failing to get back on track, a curricular adaptation was applied, which he passed. This approach allows curricular standards to be lowered for a student usually after repeating a course. The activation of a curricular adaptation requires the teacher to completely re-plan the course to adapt to the student's real learning potential. In other words, it implies a distancing from the objectives set for the other members of the class. But Benjamin's situation did not seem to be under control because he presented unusual difficulties for a student of his age, e.g., his writing, drawings, syntax, and vocabulary continued to be below grade level expectations. Speaking with the school principal, the particularity of the case was confirmed: "he failed languages, yes" (Be_I_T1_655). This contrasted with Benjamin's academic record, which presented relatively normal grades except for languages, and the deactivation of the curricular adaptation. The reported academic normality did not align with what was observed.

Arthur was in Grade 5. His academic situation was not good either. The school had already decided months before the end of the academic year to hold him back. This decision was conditioned by the student's limited potential for dealing with the next grade successfully. The decision to hold Arthur back revealed how difficult his situation was. This also explained the special support he received via three class sessions per week with specialized teaching staff (Ar_O_Ar3_64). These measures are only activated in response to learning problems and the need for remedial support.

A Complex Scenario: Economic Difficulty and Family Dysfunction

Both Benjamin and Arthur had highly dysfunctional family settings. His mother was not in Galicia at the time and his father was abroad. Benjamin and his two sisters were fostered by their maternal grandparents and supervised by social services. However, the situation was not easy, and his own grandmother made that clear at school. The situation was reflected by the testimony she gave to the tutor. She explained that the situation was difficult because the pay was insufficient: "for the money they give me" (Be_I_G1_769). The problem was very complicated. He had already been in a juvenile centre, a foster family, and his grandparents finally assumed the responsibility. His teacher made us aware of this situation: "if he had a normal life, if he had... a normal development since childhood" (Be_I_T1_679) meaning that if he had a stable home environment, he might have been in a better academic situation. Benjamin's grandmother lived on the outskirts, still within the boundaries of the city but in a semi-rural environment. The family got by, thanks to a supplementary income involving the care of some animals. The financial situation and the location of his home made it difficult for the child to participate in extracurricular activities: "because it costs a lot of money" (Be_I_Be1_623). Money was scarce and his grandmother, the only one with a salary, held down several cleaning jobs simultaneously to maintain the household.

Arthur lived in an extended family where several generations shared the same space: parents, grandparents, and a younger sister, who was in Grade 1 of primary school. His parents were divorced, but because of their financial difficulties, they lived in different parts of the same house. All the members of the family were unemployed and had little schooling. The main source of income was the grandfather's pension. The father received an unemployment subsidy. The file indicated that "Arthur's custody is held by his father, while his sister's is held by their mother" (Ar_O_D1_28). The village where they resided was not far from the urban centre and characterized by the coexistence of a traditional population, dedicated to agriculture and livestock, and an urban population, inhabiting the newer buildings. This situation involved tension and conflict, especially due to the differences between the long-time local families and those from a more urban origin and higher socioeconomic status.

Lastly, Jack lived in the city in a house that belonged to his maternal grandmother. His parents were approximately 30 years old. They had him at the age of 17, which meant early parenthood. His father was unemployed, and his mother worked as a cleaner three days a week. Both had little schooling. His mother seemed to be the head of the family because she contributed the only salary, managed the schooling, looked after the children, and dealt with the difficulties resulting from the ADHD.

These cases shared the following common elements: very low parental education levels and financial difficulties due to unemployment or minimal wages. Even in a developed country like Spain, these situations undoubtedly involve very high vulnerability and risk of exclusion, which exemplifies the national child poverty rate of over 30% (European Commission, 2018b). Rather than abject poverty and high levels of material deprivation, it is more a risk relating to financial and social limitations as well as lack of opportunities (González-Bueno, 2014).

Schools at a Crossroads? When Availability Does Not Guarantee the Use of Technological Equipment

Jack, Benjamin, and Arthur attended schools participating in the Abalar project. Their classrooms had a laptop for each child with Internet access and various educational resources. Nevertheless, the potential these devices offer for digital competence, requires a revision of school planning designs. Participation in the program implies acceptance by the school faculty.

For whatever reason, very limited use of the 1:1 equipment was observed. Arthur used computers similarly to textbooks, which meant putting the focus on the search for information and interactive exercises. The ICT coordinator defended this approach, "so children have to learn to use a book, to extract from the book and, in addition, to know how to search for information on the Internet" (Ar_I_C-TIC_29). Arthur's teacher, with more than 20 years of experience, emphasized the importance of searching, but her language revealed a lack of training in search strategies, placing the focus on avoiding risk, "...by adding more details of what you want to look for, but then I started directing him myself to specific pages." (Ar_I_T1_299). To illustrate Arthur's relationship with technology, a critical incident happened in a classroom session dedicated to searching on the Internet about an author. During his search, the child found a page with sketches by the author, which included a collection of naked women. While the rest of his classmates avoided this type of content, he focused his attention there, until a companion gave him away "Arthur is watching naked girls!" (Ar_O_D20_23); fulfilling one of the fears the tutor had regarding the risks of free Internet search.

The computer was used, therefore, to search for information or at best to make a presentation in Impress, a program in the OpenOffice suite. Arthur spent little time on this, as the class usually did this type of work when Arthur was out of the room for remedial education sessions. His difficulties were not limited to working with the computer:

> Arthur has difficulty...simply knowing how to...open an Impress, get into his folder, and save something. And the others are different, the others... more or less get by, but this child in particular... the difficulties he has in other areas are also there. (Ar_I_T1_317)

However, the school went no further, because the support that Arthur needed in terms of individualized learning was also needed for digital competence. Nevertheless, nothing indicated that the school was going to resolve the situation.

The search for information was a common pattern in the three cases. A similar situation also occurred with Benjamin and Jack. They never got past that point. The equipment was available, but the classroom activities did not make it possible to take advantage of all its potential. Benjamin's teacher was asked to act as a mediator in a conflict with families in a previous tutoring session. The teacher was given specific indications regarding a teaching style recognizable and understandable to families. Everything revolved around the textbook, which functioned as a type of peace agreement between families and the school: "what they want is a notebook where they see that work is being done, but if on the other hand you work a different way, then ...what might they be doing?" (Be_I_T1_861). This implies a partial use of resources, an exploration of the first dimension of digital competence in the

form of information search that complements the tasks proposed by the textbook, and a situation that we recognized from Arthur's experience. Information was "sometimes searched for on their own because I tell them that they have to learn to search... Ok, I'll look for it" (Be_I_T1_1099). This situation was even recognized by the school administration "...finding information? Anything that's not in Wikipedia doesn't exist "(Be_I_P1_611). Not very different from Jack. The use of technology in this case was equivalent to using the textbook as a reference.

The search for information was a key aspect and everything seemed to indicate that Jack was skillful in this area: "because if he is on the team, no matter who the other members of the team are, he is the one who is going to search for information" (Ja_I_T1_789). Jack's case involved an interim teacher without a permanent position, but who had had a very long career since "this is my twenty-eighth or twenty-ninth year at school" (Ja_I_T1_625). In any case, hardly any area other than searching was explored. As the mother told us, "some exercises in the book do ask them to find information about a writer or something on the Internet and they have to look for it themselves" (Ja_I_M1_312). This is the case of the sonnet: "now you are going to use Abalar's computers and search in Google as a team. You are going to search for a sonnet, ok? A poem that is a sonnet" (Ja_I_T1_177). The child recognized that nothing other than this format is done: "Interviewer: Did they teach you at school about...well...how to use technology? Jack: No." (Ja_I_Ja3_340-341). The children had conflicting feelings. On the one hand, they saw themselves as controlling the situation "I am the one who knows the most [in the class]" (Ja_I_Ja1_876), however their limitations were also evident, "not much about the computer because I never use it "(Ja_I_Ja2_799).

Considering the five dimensions in the DigComp (Vuorikari et al., 2022) the results reveal the scarcity of opportunities provided at school because only the most instrumental aspects of information and data literacy were addressed. The remaining dimensions were left out of consideration. There were some specific instances of digital content creation, such as Arthur's use of Impress, but safety or problem solving were not addressed. Neither did communication and collaboration appear. This situation deserves attention considering the challenge that managing all the technologies children encounter in their daily lives in and outside the school entails.

Discussion and Conclusions

The aim of this study focused on looking into the development of the digital competence in schools in Galicia, Spain based on using the 1:1 computing program model. The study of these three cases revealed low levels of digital competence. School work mainly encouraged information and data literacy to the detriment of the other competence dimensions (Vuorikari et al., 2022). The dimensions that were not promoted at school were strongly dependent on the cultural capital of the family (Bourdieu, 1990), which was very limited in these three cases because the parents had limited schooling and resources. Schools have no direct influence over certain aspects but they can help to compensate. As Erstad (2010) states, digital competence is related to overall results at school and parents' educational background. These children's parents were unemployed and had only a basic

education, and therefore the educational institution had the greatest responsibility.

Our findings illustrate the influence of socio-family factors on the development of digital competence, as several authors have previously highlighted (Aesaert et al., 2015; Selwyn & Facer, 2007; van Dijk, 2005). Furthermore, there is a need to reconsider this situation from perspectives such as cultural capital (Bourdieu, 1990). Regarding the curricular need to address digital competence, the participating teachers undervalued it. In this context, the implementation of a 1:1 computing program could enrich more intensively all the dimensions of digital competence. This finding confirms previous research (Area & Sanabria, 2014).

Helping to understand the role that schools play in this situation is important. Public administrations have promoted policies that necessarily require the provision of equipment and digital infrastructure. They have not neglected the contribution to new pedagogical models or the improvement of educational practices in their educational objectives when promoting 1:1 programs (AMTEGA, 2013; Xunta de Galicia, 2010). This objective is still present in the reality of current policies (European Commission, 2018a, 2021). However, in line with other studies, we see that difficulties persist (Carretero et al., 2021). Other studies such as SELFIE (Castaño-Muñoz et al., 2021) show how this is perceived by the school administration, teachers, and students, but a more detailed analysis of the day-to-day reality of the classroom is needed. This situation emphasizes the need to revise school curricula as Howard et al. (2015) point out. Regardless of material and organizational conditions, teachers and educational centres require specific guidelines regarding what it is expected of their work in relation to all dimensions of digital competence to promote further development in contrast with current data (Fraga-Varela et al., 2020). While our objective is clear, we need first to revise and enrich the work that is being done at schools as well as their curriculum and the applicable legislation. Everything suggests that this type of learning has not been prioritized nor has it been structured or organized properly to effectively integrate into the classroom.

The implications of all these elements need to be analyzed in the teaching pedagogical patterns. Teaching with the same materials and the same teacher planning design, even with the extensive availability of technology under the 1:1 model, does not lead to change or transformation, but instead reproduces the same results (Salinas-Amescua, 2007). The dependence on textbooks and their structure prevents the exploration of digital environments and brings to light the enormous challenge of working with them (Sadera & Parrish, 2018). It also reveals a lack of teacher knowledge regarding technology, which is necessary for taking advantage of its potential (Öqvist & Högström, 2018). This is evident in all three cases. Arthur, Benjamin, and Jack presented no change or learning in the school environment to allow improvement in the appropriation of the available technology. These cases force us to question the potential of digital technologies for overcoming social and cultural inequalities and the true role of schools is this day and age, seeing as technological equipment in and of itself produces no change at all (Cuban, 2015). The need is also clear for families and schools to work in sync to bridge the gaps between them.

References

Aesaert, K., van Braak, J., van Nijlen, D., & Vanderlinde, R. (2015). Primary school pupils' ICT competences: Extensive model and scale development. *Computers & Education*, *81*, 326-344. https://doi.org/10.1016/j.compedu.2014.10.021

Alonso-Ferreiro, A., & Gewerc, A. (2015). ICT teachers' lifelong training in Galicia: Do we always trip over the same stone? *Innovación educativa*, *25*, Art. 25. https://doi.org/10.15304/ie.25.2757

Area, M. (2011). The effects of the Model 1:1 in the educational change in schools. Evidence and challenges for the Ibero-american policies. *Revista Iberoamericana de educación*, *56*, 49-74.

Area, M., & Sanabria, A. L. (2014). Opinions, expectations and evaluations of teachers participating in the School Program 2.0 in Spain. *Educar, 50*(1), 15-39. https://raco.cat/index.php/Educar/article/view/287066

Axencia Para A Modernización Tecnoloxia De Galicia (AMTEGA) Agency for the Technological Modernization of Galicia. (2013). *Free Software Action Plan Year 2013 Free Software Coordination Office.* https://amtega.xunta.gal/es/documento/plan-de-software-libre-2013

Blau, I., Peled, Y., & Nusan, A. (2016). Technological, pedagogical and content knowledge in one-to-one classroom: Teachers developing "digital wisdom". *Interactive Learning Environments*, *24*(6), 1215-1230. https://doi.org/10.1080/10494820.2014.978792

Bourdieu, P. (1990). *In other words: Essays towards a reflexive sociology*. Stanford University Press.

Bourdieu, P. (2008). *Cultural capital, school and social space.* Siglo XXI Editores.

Breuch, L. A. K. (2002) Thinking critically about technological literacy: Developing a framework to guide computer pedagogy in technical communication, *Technical Communication Quarterly, 11*(3), 267-288, https://doi.org/10.1207/s15427625tcq1103_3

Carretero, S., Napierała, J., Bessios, A., Mägi, E., Pugacewicz, A., Ranieri, M., Triquet, K., Lombaerts, K., Robledo-Bottcher, N., Montanari, M., & Gonzalez-Vazquez, I. (2021). *What did we learn from schooling practices during the COVID-19 lockdown?: Insights from five EU countries*. Publications Office of the European Union. https://data.europa.eu/doi/10.2760/135208

Castaño-Muñoz, J., Weikert García, L., & Ministerio de Educación y Formación Profesional. (2021). The digital capacity of schools in Spain. Representative sample through SELFIE. Primary Education *(CINE-2011 1).* Publications Office. https://data.europa.eu/doi/10.2760/346765

Claro, M., Preiss, D. D., San Martín, E., Jara, I., Hinostroza, J. E., Valenzuela, S., Cortes, F., & Nussbaum, M. (2012). Assessment of 21st century ICT skills in Chile: Test design and results from high school level students. *Computers & Education*, *59*(3), 1042-1053. https://doi.org/10.1016/j.compedu.2012.04.004

Coller, X. (2005). *Case study*. CIS.

Cuban, L. (2015, October 20). Does integrating computers into lessons mean that teaching has changed? Larry Cuban on School Reform. https://larrycuban.wordpress.com/2015/10/20/does-integrating-computers-into-lessons-mean-that-teaching-has-changed/

Dussel, I. (2017). Perspectives, tensions and limits in the evaluation of 1:1 policies in Latin America. In S. B. Larghi & R. W. Iparraguirre (Eds.), Digital Inclusion: a critical look at the evaluation of de 1:1 model in Latin America (pp. 143-164). Teseo.

Erstad, O. (2010). Educating the Digital Generation. *Nordic Journal of Digital Literacy*, *5*(01), 56-71.

Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology Research and Development, 53*(4), 25–39. http://www.jstor.org/stable/30221207

European Commission. (2006). Recommendation of the European Parliament and of the Council of 18 December 2006 on key competences for lifelong learning. In *OJ L,* L394. http://data.europa.eu/eli/reco/2006/962/oj/eng

European Commission. (2018a). Council Recommendation of 22 May 2018 on key competences for lifelong learning (Text with EEA relevance). *Official Journal of the European Union,* C 189/01. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32018H0604%2801%29&qid=1643797485584

European Commission. (2018b). *Country report Spain 2018 including an in-depth review on the prevention and correction of macroeconomic imbalances*. https://ec.europa.eu/info/sites/default/files/2018-european-semester-country-report-spain-en.pdf

European Commission (2020a). *Communication from the Commission to the European Parliament, The Council, The European Economic and Social Committee of Regions. Digital Education Action Plan 2021-2027 Resetting education and training for the digital age*, (2020) (testimony of European Commission). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020DC0624

European Commission. (2020b). *European Skills Agenda for Sustainable Competitiveness, Social Fairness and Resilience*. https://ec.europa.eu/social/BlobServlet?docId=22832&langId=en

European Commission. (2021). *Member States' digital progress through the Digital Economy and Society Index (DESI)*. https://ec.europa.eu/newsroom/dae/redirection/document/80563

Ferrari, A. (2013). *DIGCOMP: A framework for developing and understanding digital competence in Europe*. http://digcomp.org.pl/wp-content/uploads/2016/07/DIGCOMP-1.0-2013.pdf

Fraga-Varela, F., & Alonso-Ferreiro, A. (2016). Presence of digital Textbook in Galicia (Spain): A statistical-geographic snapshot of the E-DIXGAL Project. *Profesorado. Revista de Curriculum y Formación de Profesorado, 20*(1), 91-112. https://digibug.ugr.es/handle/10481/42554

Fraga-Varela, F., Vila-Couñago, E., & Martínez-Piñeiro, E. (2020). Information and Data Literacy of Galician (Spain) tweens: a mixed study. *RISTI - Revista Ibérica de Sistemas e Tecnologias de Informação*, *38*, 17-32. https://doi.org/10.17013/risti.38.17-32

Fullan, M. (2001). *The new meaning of educational change*. Routledge.

Gewerc, A., & Armando, J. (2016). New literacies in the intellectual field of education: Mapping theoretical perspectives in scientific publications. In D. Fonseca & E. Redondo (Eds.), *Handbook of research on applied E-learning in engineering and architecture education* (pp. 88-113). Engineering Science Reference.

Glaser, B. G., & Strauss, A. L. (1967). *The Discovery of grounded theory: Strategies for qualitative research.* Aldine Publishing.

González-Bueno, G. (2014). Child Poverty and Crisis Impact on Chilhood. *Educación y futuro: revista de investigación aplicada y experiencias educativas*, (30), 109-126.

Howard, S. K., Chan, A., & Caputi, P. (2015). More than beliefs: Subject areas and teachers' integration of laptops in secondary teaching. *British Journal of Educational Technology*, *46*(2), 360-369. https://doi.org/10.1111/bjet.12139

Kampylis, P., Punie, Y., & Devine, J. (2015). Promoting effective digital-age learning. *A European Framework for Digitally Competent Organisations.* http://publications.jrc.ec.europa.eu/repository/bitstream/JRC98209/jrc98209_r_digcomporg_final.pdf

Martin, A. (2006). A European framework for digital literacy. *Nordic Journal of Digital Literacy*, *1*(02), 151-161. https://doi.org/10.18261/ISSN1891-943X-2006-02-06

Martin, A. (2008). Digital literacy and the digital society. *Digital literacies: Concepts, policies and practices*, *30*, 151-176. https://doi.org/10.4236/ce.2017.810110

Martin, A., & Grudziecki, J. (2006). DigEuLit: Concepts and tools for digital literacy development. *Innovation in Teaching and Learning in Information and Computer Sciences*, *5*(4), 249-267. https://doi.org/10.11120/ital.2006.05040249

Miles, M., & Huberman, A. M. (1994) *Qualitative data analysis: A sourcebook of new methods*. Sage.

Muñoz, J., & Sahagún, M. A. (2010). Qualitative computer-aided análisis with ATLAS.ti. In C. Izquierdo & A. Perinat (Coords.) *Investigar en psicología de la comunicación. Nuevas perspectivas conceptuales y metodológicas* (pp. 301-364). Amentia.

Öqvist, A., & Högström, P. (2018). Don't ask me why: Preschool teachers' knowledge in technology as a determinant of leadership behavior. *Journal of Technology Education*, *29*(2), 4-19. http://doi.org/10.21061/jte.v29i2.a.1

Order of June 28 (2010) (Galicia, Spain). https://www.xunta.gal/dog/Publicados/2010/20100706/Anuncio21E16_es.pdf

Organic Law 3/2020 of Education (2020) (Spain). https://www.boe.es/eli/es/lo/2020/12/29/3/con

Redecker, C., & Punie, Y. (2017). Digital competence framework for educators (DigCompEdu). *European Union*. http://publications.jrc.ec.europa.eu/repository/bitstream/JRC107466/pdf_digcomedu_a4_final.pdf

Rockwell, E. (2008). From Field to Text: Dilemmas of ethnographic work. In M. I. Jociles Rubio & A. Franzé Mudanó (Eds.). ¿Es la escuela el problema?: Perspectivas socio-antropológicas de etnografía y educación (pp. 90-111). Trotta.

Sadera, W., & Parrish, A. (2018). Teaching Competencies for Student-Centered, One-to-One Learning Environments: A Delphi Study. *Journal of Educational Computing Research*, *57*. https://doi.org/10.1177/0735633118816651

Sala, A., Punie, Y., Garkov, V., & Cabrera, G. M. (2020, julio 3). *LifeComp: The European Framework for Personal, Social and Learning to Learn Key Competence*. JRC Publications Repository. https://doi.org/10.2760/302967

Salinas-Amescua, B. (2007). Adult instructors' perceptions on ICT and diffusion practices: implications for equity of access. *Canadian Journal of Learning and Technology / La revue canadienne de l'apprentissage et de la technologie 33*(2). https://doi.org/10.21432/T2P01K

San Martín, Á., Peirats Chacón, J., & Gallardo, M. (2014). Smart Educational Centre. Lights and shadows on the policies of technological transferences and teaching practice. *Profesorado. Revista de currículum y formación del profesorado*, *18*(3), 63-79.

Selwyn, N. (2004). Reconsidering political and popular understandings of the digital divide. *New Media & Society*, *6*(3), 341-362. https://doi.org/10.1177/1461444804042519

Selwyn, N. (2011). Technology, media and education: Telling the whole story. *Learning, Media and Technology*, *36*(3), 211-213. https://doi.org/10.1080/17439884.2011.572977

Selwyn, N. (2014). Education and 'the digital'. *British Journal of Sociology of Education*, *35*(1), 155-164. https://doi.org/10.1080/01425692.2013.856668

Selwyn, N., & Facer, K. (2007). *Beyond the digital divide*. Futurelab. http://archive.futurelab.org.uk/resources/documents/opening_education/ Digital_Divide.pdf

Selwyn, N., & Facer, K. (Eds.). (2013). *The politics of education and technology. Conflicts, controversies, and connections*. Palgrave Macmillan.

Selwyn, N., & Husen, O. (2010). The educational benefits of technological competence: An investigation of students' perceptions. *Evaluation & Research in Education*, *23*(2), 137-141. https://doi.org/10.1080/09500790.2010.483515

Simons, H. (2009). *Case study research in practice*. Sage.

Stake, R. E. (1995). *The art of case study research*. Sage.

Valiente, Ó. (2011). Models 1:1 in education. International practices, comparative evidence and policy implications. *Revista Iberoamericana de Educación*, *56*, 113-134. https://doi.org/10.35362/rie560513

van Dijk, J. (2005). *The deepening divide: Inequality in the information society*. Sage.

van Dijk, J. & van Deursen, A. (2014). *Digital skills: Unlocking the information society* (First edition). Palgrave Macmillan.

Vekiri, I. (2010). Socioeconomic differences in elementary students' ICT beliefs and out-of-school experiences. *Computers & Education*, *54*(4), 941-950. https://doi.org/10.1016/j.compedu.2009.09.029

Vuorikari, R., Kluzer, S., & Punie, Y. (2022). *DigComp 2.2: The Digital Competence Framework for Citizens - With new examples of knowledge, skills and attitudes*. JRC Publications Repository. https://doi.org/10.2760/115376

Xunta de Galicia. (2010). *Integration of ICT in educational practice.* http://www.edu.xunta.gal/portal/sites/web/files/protected/content_type/file/2010/03/10/20100308_presentacion_abalar.pdf

Yin, R. K. (2017). *Case study research and applications: Design and methods.* Sage.

Zhong, Z.-J. (2011). From access to usage: The divide of self-reported digital skills among adolescents. *Computers & Education*, *56*(3), 736-746. https://doi.org/10.1016/j.compedu.2010.10.016

Authors

Fernando Fraga-Varela received a Ph.D. in research and innovation in didactics and school organization and is currently a professor at the University of Santiago de Compostela and a member of Stellae Group (GI-1439). He has combined the experience in classrooms with the work of research in the field of educational technology. Email: fernando.fraga@usc.es

Almudena Alonso-Ferreiro received a Ph.D. in design and innovation in education. Her research interests include educational technology, with a focus on digital competence, the training of future teachers, and the potential of the new media in educational processes. Stellae Group (GI-1439) and CIES-Uvigo Group. Email: almalonso@uvigo.es