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Doctoral Compendium

S-TVET Students' Experiences of Information Interaction Activities and Their Understandings of Digital Abilities, Within and Outside of Classrooms

Alumnos de Educación Media Técnica Profesional (EMTP): experiencias sobre las actividades de interacción con información y entendimientos de habilidades digitales, dentro y fuera del aula de clase

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TABLE OF CONTENTS

INDEX OF TABLES

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ABSTRACT

It is argued that today is an information-driven society where digital abilities are key. Developing these abilities within school classrooms has become a priority. Governments have invested in formal education aimed at developing them. Yet, research suggests that a majority of students can only complete basic and explicit information-gathering and management tasks within digital environments. Literature holds that for the development of digital abilities, students' experiences should be front and center. There are still important gaps within our understanding of students' expressed experiences of instances in which they employ digital abilities. Three important gaps have to do with: a lack of systematization of the techniques and tools employed within academic research for the development of digital abilities; a shortage of studies that examine government policies and directives driving the venture for digital ability development within the Secondary Technical and Vocational Education and Training (S-TVET) system; and, a lack of studies that analyze S-TVET students' expressed experiences of activities that require the enactment of digital abilities. This doctoral study addresses such gaps by means of three research articles: a systematized literature review; a discourse analysis of Chilean S-TVET public policy; and, a phenomenographic exploration of 24 Chilean S-TVET students.

RESUMEN

Se argumenta que vivimos en una sociedad de la información donde las habilidades digitales resultan imprescindibles. Diferentes gobiernos han invertido recursos para ofrecer oportunidades que permitan desarrollar dichas habilidades dentro de aulas escolares. A pesar de dicha inversión, existe evidencia que sugiere que estudiantes solo llegan a resolver tareas básicas y explícitas de recolección y manejo de información en ambientes digitales. La literatura establece que las experiencias de estudiantes deberían estar al centro de las actividades que buscan desarrollar habilidades digitales. Aun existen vacíos importantes en nuestro conocimiento sobre las experiencias de estudiantes, como: poca sistematización de técnicas y herramientas empleadas para el desarrollo de dichas habilidades; escasez de estudios que examinen políticas y directrices gubernamentales que estipulan pautas para el desarrollo de habilidades digitales dentro del sistema de Educación Medica Técnica Profesional (EMTP); y falta de investigaciones que examinen experiencias de primera fuente de estudiantes matriculados en la EMTP. La presente investigación doctoral atiende dichos vacíos por medio de tres investigaciones: una revisión de literatura sistematizada; un análisis de discurso de políticas y directrices públicas circunscritas al desarrollo de habilidades digitales dentro del sistema EMTP chileno; y una exploración fenomenográfica donde participaron 24 estudiantes matriculados en la EMTP chilena.

I.   INTRODUCTION

This doctoral research project set out to better comprehend three entwined phenomena (see Bolaños, 2018, 2019). One, the qualitatively distinct manners of experiencing information interaction activities (henceforth, IIA) within digital environments, both within and outside of classrooms. Two, students' expressed understandings of the enacted digital abilities (henceforth, DA) when addressing such activities, also within and outside of classrooms. Three, the relationship between these in-and-out of school experiences.

The early conception of the doctoral project was squarely situated within a relational-constitutionalist understanding (see Bowden & Green, 2005; Trigwell, 2000). As a method, phenomenography was favored. However, after the first leg of the doctoral project, it became clear that only relying on phenomenography would not suffice. Emerging phenomenographic categories pointed to a befuddling finding: the existence of similarities in spaces where it was thought that there should be no similarities. The students who participated within this study were matriculated within the Chilean Secondary Technical and Vocational Education and Training (S-TVET) system; notwithstanding, findings suggested conspicuous similarities between S-TVET students' experiences, and experiences from other students matriculated in school contexts that one would assume would be significantly different (see Bolaños & Salinas, 2020). Why would this be so? After an exercise in *triangulaxivity* (Koro-Ljungberg, 2015), it became evident that in order to better comprehend students' experiences, only studying their expressed experiences and understandings by means of phenomenography would not suffice.

Triangulaxivity entails both triangulation and reflexivity (Koro-Ljungberg, 2015). These concepts have meant different things throughout different periods and mean different things in different

contexts and fields (Koro-Ljungberg, 2015). In this compendium, for example, investigator triangulation was used during the phenomenographic study so as to bolster the credibility and trustworthiness of emerging categories (see Bolaños & Salinas, 2020). Koro-Ljungberg (2015), however, employs them within the field of research methodology. For her, and within such a field, triangulation implies the use of several approaches (methodology) so as to better comprehend a phenomenon (Koro-Ljungberg, 2015). And reflexivity is referent to a researcher's own pensive practice throughout the process and a desire to probe even if the methodologies that will eventually be used are not thought to be sound between one another (Koro-Ljungberg 2015). As long as the approach and the method used to study are sound in one leg of the journey, the next leg can in fact venture into different approaches and methods: "*meanings could also be thought of through plurality. For meaning does not necessarily need to close down dialogue, and meaning can, indeed, be multiple*" (Koro-Ljungberg, 2015, p. 18).

In the search for an answer to the befuddling finding, it soon became evident that individuals come to see, consent, and validate what is acceptable and what is not by means of *regimes of truth* (Foucault, 1980b). Regimes of truth, in the form of discourses, mediate the way individuals come to see, consent, and validate (Howarth & Stavrakakis, 2000; Jørgensen & Phillips, 2002b). Discourses, then, mediate the way we come to experience (Foucault, 1980b; Laclau; 1990; Laclau & Mouffe 2001; Marttila, 2015). Thusly, exploring how digital abilities are thought to be learned, and therefore taught, as well as what public policy, and other normative documents, think of such abilities, and how they should be developed, is invaluable. While true that what is stipulated by discourses does not necessarily reach the classroom or students, such discourses can scatter into

classroom activities via *translation* (Perryman, Ball, Braun, & Maguire, 2017). Ultimately affecting students' experiences and understandings.

Congruently, two further stages were envisioned. On the one hand, it was deemed important to explore how digital abilities are reported to be taught within classrooms via a systematized literature review. On the other, by means of discourse analysis, how digital abilities, and digital ability development, are understood by public policy and other normative documents was also explored. Consistently, this doctoral compendium presents and is comprised of three research articles. These three articles are to be thought of as three different windows, grafted from different materials, at different moments of the doctoral process and positioned at different angles. In conjunction, they all offer insight into students' forms of experiencing and coming to understand IIA and DA. What unifies the three articles is the desire to better comprehend S-TVET students' forms of experiencing and expressing their understandings.

The first article, a systematized literature review as defined by Grant and Booth (2009), explores the techniques (e.g., scaffolding, collaboration, or problem-based learning) and tools (e.g. computers, tablets, books, or storyboards) reported as being used by teachers within empirical research focusing on in-class digital ability development. In addition, the literature review indicates that students' experiences of tasks that require the enactment of DA, as expressed by them, are rarely taken into consideration by academic research. Furthermore, studies that attempt to better comprehend the habitual routine of classroom DA development are also scarcer when compared to interventions. In addition, the review points to the fact that studies that simultaneously explore the in-and-out of school facet are not the norm, thusly neglecting an important area of students' experiences and worlds. Finally, the review found no article that situated its study within

the S-TVET world – a finding that is of special importance, as will be discussed further on. Thusly, at the cross-section of DA development within classrooms and students' experiences, there are important gaps in knowledge.

The second article within this compendium, a discourse analysis exploration grounded in concepts derived from Laclau and Mouffe (Laclau, 1990; Laclau & Mouffe, 2001), sought to comprehend the discursive rules within public policy and other normative documents (i.e. curricular texts) that privilege certain forms of experiencing and enacting; thusly mediating students distinct forms of experiencing IIA and enacting DA to approach such activities. Through such an analysis, it was possible to render salient articulations that anchor two types of discourses (i.e., an instrumentalization and an empowerment discourse) to the myth (i.e., a hegemonic articulation of moments that appears to *fix* a reality – see Bolaños & Pilerot, 2021 and/or Laclau, 1990 and/or Laclau & Mouffe, 2001) of the information society. It was also possible to describe how discourses mediate the preferred way of experiencing an IIA and understanding DA within classrooms. Likewise, it offers a possible answer as to why students can experience IIA, within S-TVET courses, as not being conducive to developing those DA realtered with critical interaction of information. By critical interaction of information, it is understood that students can not only identify, locate, retrieve and store information but also cross-check to assess the validity and credibility of information as well as contextualize the information given the author or authors that present such information (see, for example, Ferrari 2013). Furthermore, by evincing articulations between Chilean public policy with international public policy, it also offers insights that contribute to a more comprehensive examination of students' experiences of IIA, the way they approach them, and their expressed understandings of DA. Lastly, by shedding light on the

prevalent discourse (i.e., an instrumentalization discourse) surrounding digital ability development within S-TVET, it offers suggestions for further public policy development.

The third article offers a close-up look at the qualitatively distinct manners in which Chilean S-TVET students experience an IIA within digital environments and the strategies that they report employing when addressing such activities within digital environments. This article adhered to a relational-constitutionalist understanding (see Bowden & Green, 2005; Trigwell, 2000) where what was favored was the use of phenomenographic interviews in order to allow Chilean S-TVET students' voices to articulate experiences. Findings indicate that, within school, students experience an IIA in three hierarchically related forms; meaning that each form of experiencing is related to one another in ascending order of complexity. Outside-school there are four distinct hierarchically related forms. Concerning students' forms of approaching IIA, and for both settings, students express three different, likewise hierarchically related, approaches. There is also evidence that suggests that there are several similarities between students in-and-out-of school experiences and that the current design of S-TVET might not be favorable for developing DA to approach IIA so as to critically interact with information.

For all three articles, an exploratory approach as understood by Lundh, Limberg, and Lloyd (2013) was chosen. Thusly, when referencing IIA and DA no adscription to any particular framework was favored. Having an adscription, for this study, would be methodologically unsound. The literature review utilized a wide-encompassing search code so as to retrieve as vast an amount of academic research as possible (see Bolaños, Salinas, & Pilerot, 2022). The discourse analysis manuscript pursued an exploration where what would be important would be the understandings as set forth by public policy and other normative documents (see Bolaños & Pilerot, 2021). Lastly, the

phenomenographic text privileged students' understandings, and sought to capture as much variability as possible (see Bolaños & Salinas, 2020). However, and despite the exploratory approach and absence of adscription to any framework, this doctoral thesis places focus on those DA that are needed so as to critically interact with information. Such a focus is warranted given the primacy of interacting with information in today's information-driven society (see, for example, Anderson, 2008; Care et al., 2015; Griffin, McGaw, & Care, 2012; van Deursen & van Dijk, 2014).

This compendium is structured as follows: Firstly, a background section provides an overview of IIA, DA, and students' experiences. Subsequently, the doctoral study's objective and research questions will be provided. In this same section, the relationships between articles and research questions will also be addressed. Likewise, a brief overview of the studies' methodology and methods will be given. Such a succinct description of methodology and method was preferred to avoid repetitiveness with the published manuscripts that comprise this doctoral compendium. Afterward, the particular site (i.e., Chile's S-TVET system) for this study will be detailed. Immediately after, all three research articles will be presented. All articles that comprise this compendium have been published, and copyright of the articles has been transferred to the corresponding Publisher. Accordingly, only the abstract will be provided within this compendium. Lastly, an articulation of all research findings will be arranged and will be accompanied by possible further explorations.

II. INFORMATION INTERACTION ACTIVITIES, DIGITAL ABILITIES AND STUDENTS' EXPERIENCES

It is maintained that today's society is an information-driven society (Anderson, 2008; Care et al., 2015; Griffin, McGaw, & Care, 2012; van Deursen & van Dijk, 2014). Developments in computing and information communication technologies (ICT) have made information creation, innovation, storage, and distribution the modern currency of contemporary societies (Anderson, 2008; Care et al., 2015; Fraillon, Ainley, Schulz, Friedman, & Duckworth, 2020; van Deursen & van Dijk, 2014). Vast amounts of available information, however, is not what has substantially altered our society. Even more, the speed and forms with and in which information can be manipulated and shared are argued to be a decisive cog (Anderson, 2008; Castells, 2010). It is suggested that today we live in what can be described as a mesh of a knowledge society, which presupposes an information society (Anderson, 2008), and a risk society (Beck, 2000; Giddens, 1991). Fast pace changes and the necessity to anticipate, adapt, and control them, hurdle people into a society where categories and understandings quickly become strained (Beck, 2000; Giddens, 1991); and were being able to adequately scrutinize vast amounts of information is paramount (Anderson, 2008). Under such an articulation, the manner in which one approaches IIA is crucial.

Continuing with IIA, and as was previously stated, the availability of information is not necessarily the decisive feature of today's society (Castells, 2010); rather, the form and speed in which ICT have made it possible to access and manipulate information is what is pivotal (Anderson, 2008; Castells, 2010; van Deursen & van Dijk, 2014). As such, it is argued, *"[…] for today's web, users require more than merely technical skills in order to function effectively"* (van Deursen & van Dijk, 2014, p. xi). Congruently, activities, where one can not only locate, identify, retrieve and process, but also transform information into knowledge, are of significant importance (Anderson,

2008; Care et al., 2015; Karpati, 2011; van Deursen & van Dijk, 2014). However, information and knowledge can be defined and understood in a variety of forms – see, for example, Zins's (2007) Critical Delphi study with 57 participants from the field of Information Science. In addition, and as is pointed out by Bates (2005), both are context-dependent (taken to mean different things in different fields – e.g. information science or natural science) as well as dependent on the historical time period. Within the field of DA development in classrooms, there seems to be less focus on defining each of these concepts. Such a statement is warranted given the lack of definition of such concepts within the empirical studies that were extracted for the systematized literature review conducted within the frame of this doctoral study (see Bolaños, Salinas, and Pilerot, 2022). Additionally, and in the field of public policy, there also seems to be a lack of focus on defining such concepts, as is argued by Nivala (2009):

> The transition to the information society is considered to be a profound change, on a par with the Industrial Revolution, affecting every aspect of human life and society (Garnham, 2000; Golding, 2000; Goodwin & Spittle, 2002), but its definitions in the discourse are limited to ambiguous references to knowledge being at the center of the economy, knowledge as the new capital and as the most important factor in production. This has created a tangled web of premises, albeit a widely accepted one, to which governments have responded by issuing information society strategies without distinguishing data from information, information from ICT, ICT from knowledge, or any of these from globalization and the information society (p. 434).

In addition, important manuscripts that set out definitions and understandings of DA also lack a clear definition of information or knowledge. As an example, Griffin et al. (2012) seem to equate the two: *"The information-based role of education in developing twenty-first century skills in an*

information or knowledge economy has become indisputable" (Griffin et al., 2012, p. 4). A question that can linger after reading such a sentence is: are knowledge economy and information economy the same? However, the authors do not define information economy nor knowledge economy; leaving the reader to infer what is meant by them. A similar confusion can exist after reading van Deursen and van Dijk (2014). From their text, one can infer that knowledge is derived by the processing of information, thusly falling into a linear understanding of these, where information comes before knowledge (see Zins, 2007). For example, on page 14 van Deursen and van Dijk state that, "*In both print and audiovisual media, knowledge can be derived";* on page 18 they affirm that, *"However, using digital media, such as the Internet, is more than the primarily mental operation of reading, writing, and gaining knowledge";* and on page 36 they comment that, *"In the peer-to-peer networking of online knowledge communities and other cooperative networks, information and experience are exchanged".* However, they also state, on page 80, that *"Furthermore, there is an ongoing debate about the quality of the knowledge on wikis, discussion forums, and other online collaboration platforms, which are typically not subject to editorial control".* What is information or knowledge, or if they are the same, is a question left to the inference of the reader. The apparent lack of rigor in defining these important concepts is further addressed within the last section of this doctoral compendium (section 6.1, Further explorations).

Given such variability in understanding and definition, and building on the exploratory nature of the doctoral project, for this undertaking IIA, are understood in the broadest terms. Furthermore, they are activities where one has to access, manipulate and transform information (understood to be external to the subject) into knowledge (understood to be internal to the subject) (see Zins, 2007). That is, transforming numbers within a spreadsheet or a blog entry about the US Civil War into knowledge, i.e. a financial report so as to engage in an investment project or for the writing

of an exposé of slavery in the USA. Such an understanding is taken given that within the information and knowledge society, the first is seen to be a precondition of the latter (see Anderson, 2008). However, above all, and similar to the approach employed by Pilerot (2016) when studying information practices, IIA are believed to entail activities that *"[embrace] norms, convention, and routines, the people acting in the site, material aspects, including the use of ICT tools, as well as the interaction between physical setting and the social site"* (p. 4). Lastly, concerning IIA, there seems to be accord within the literature that when approaching them within digital environments, people enact DA (see Griffin et al., 2012; Ferrari, 2013; Fraillon et al., 2014; van Deursen & van Dijk, 2014). Making these equally important to study and understand.

Regarding DA, these can be filled with a variety of meanings and attached to a range of connotations, not least depending on the context in which they are used. For example, ICT literacy skills (e.g. Macklin, 2008), digital competencies (e.g. García, 2016; Leger & Freiman, 2016; Perez-Mateo, Romero, & Romeu, 2014), digital literacies (e.g. Frydenberg, 2015; Hughes, 2017), Internet skills (e.g. van Deursen & van Dijk, 2014) and 21st-century digital skills (e.g. van Laar et al., 2017). It is important to note that each understanding has particularities that set it apart, and that they are not interchangeable (e.g. digital abilities are not the same as digital competencies). Each concept brings with it its own theoretical underpinnings; however, similarities between understandings of DA exist.

Firstly, there seems to be accord with the idea that there exists an amalgamated relationship between ICT and DA (Ferrari, 2013; Fraillon et al., 2014; van Deursen & van Dijk, 2014); where DA can be enacted within digital environments that, in turn, can be made possible by means of ICT. Moreover, they are conceived as abilities that require life-long and life-wide processes

(Ferrari, 2013; Fraillon et al., 2014; van Deursen & van Dijk, 2014). In addition, they are understood to be a set of abilities ranging from technical/operational to more complex abilities like collaboration and communication within digital environments (Hauge & Payton, 2010; Kalas et al., 2012; North Central Regional Educational Laboratory & Metiri Group, 2003). However, no single DA (within the range of DA) is, in and of itself, *better* or *worse*; but rather they are context-dependent. The same combination, and/or with the same intensity, of DA are not necessarily employed, for example, within school, work, or at home (see Sefton-Green & Livingstone, 2016; Thomas et al., 2016). In line with such reasoning, searching for a Netflix movie is not *less* nor *more* important than drafting a blog entry. While no DA is *better* than any other, they are hierarchy-related and interdependent (Ferrari, 2013; Fraillon et al., 2014; van Deursen & van Dijk, 2014). With the previously stated in mind, for this doctoral study DA are understood to be: abilities that enable the adequate use of digital tools, both hardware and software; communication and collaboration abilities in digital environments; information searching and retrieving abilities in digital environments; and content creation abilities in digital environments (Care et al., 2015; Fraillon et al., 2014; Griffin et al., 2012; van Deursen & van Dijk, 2014).

Another accord is that DA are fundamental for bridging digital gaps, which in turn aids individuals with critical interaction of information within the knowledge society (Anderson 2008; Rychen, & Salganik 2002). Thusly, they can contribute to the narrowing of socio-economic and cultural gaps (Ferrari, 2013; Griffin et al., 2012; van Deursen & van Dijk, 2014), and as such adequate development of them is considered key. Congruently, developing DA to approach IIA within digital environments has become a priority for education systems around the world. For example, Chile, Costa Rica, Singapore, and the United States have invested efforts trying to develop students' DA to approach IIA (see Bellei et al., 2010; Fiore et al., 2017; Ministerio de Educación

Pública Costa Rica, 2017; National Institute of Education Singapore, 2017). Exemplifying, Chile has designed a Digital Ability Matrix aimed at assisting teachers with the development of DA (see Alarcón, Álvarez, Hernández, & Maldonado, 2013); and, furthermore, Chile developed and implemented (twice, once in 2011 and the other in 2013) a nationwide standardized digital ability assessment test called SIMCE TIC (Ministerio de Educación, 2014). As one more example, and now moving towards Singapore, The National Institute of Education has invested in several studies aimed at better comprehending students' digital abilities. One such project is the "Assessment and Teaching of 21st Century Skills (ATC21S) Singapore Trials: Collective Creativity and Collaborative Problem-Solving Competencies among Secondary School Students" (National Institute of Education Singapore, 2017). The study involved 740 secondary students across 8 schools and where:

> The purpose of the study aims to contribute important new knowledge to the question of how schools can better measure, characterize and foster students' creativity and collaborative problem-solving competencies, particularly in technology-mediated learning and assessment contexts that are more reflective of our contemporary lifeworlds (National Institute of Education Singapore, 2017).

However, despite such interest, there is evidence that suggests that students can, at best, completely basic and explicit information-gathering and management tasks within digital environments (Claro et al., 2012; Fraillon et al., 2020; Fraillon, Ainley, Schulz, Friedman, & Gebhardt, 2014; Ministerio de Educación, 2014). Such a finding is intriguing given that there are several suggestions for how DA to approach IIA should be developed.

There seems to be an agreement in the literature that developing DA is better done when students' experiences and worlds take front and center stage (Ertmer & Newby, 2013; Kang, Choi & Chang, 2007). For example, Hague and Payton (2010) highlight the commitment made by different groups who *"[…] emphasis the importance of young people's lived experiences and acknowledging these by incorporating them, along with young people's interests, into the curriculum"* (p. 13). Similarly, Lewin and Charania (2008) remark that:

> …[t]o harness the potential benefits of informal learning in formal contexts, there is a need to shift formal pedagogical practices from transmissive approaches to collaborative, student-centered, and self-directed approaches to create opportunities for young people to draw on everyday knowledge and practices (p. 210).

Furthermore, with the advent of ICT and computing, there are those who argue that students' experiences as lived within their different worlds (e.g. home and school) are spilling into each other, thusly making it important not only to study them but understanding how they relate to one another (Ertmer & Newby, 2013; Thomas et al., 2016). ICT and computing have also allowed students from different corners of the world to share a same *space*, thusly bringing novel forms of experiencing into such spaces (Ertmer & Newby, 2013). Novel forms of experiencing, though, need not be novel because they branch from different corners of the world. There are several possible sources contributing to variation in the ways something is experienced. For example, differences in experiencing may arise from socio-cultural and economic conditions that lead to different forms of rearing and interacting with the surrounding world (Lareau, 2003). Similarly, certain groups have specific tacit rules that mark the way members experience. As an example, Dubet and Martuccelli (1998) point to worlds that are edified between friends and peers where shame can be a powerful tool that produces specific accepted practices that lead to certain forms

of experiencing. In the same vein as the former example, in the ethnographic work conducted by Sefton-Green and Livingstone (2016), the reader is privileged to how differences in gender, social groups, and cultural capital affect the way that students experience their world. Variability in experiences, it thus follows, arises from a multitude of sources.

Furthermore, variability in experiences has been found to have an effect on the manner of approaching and solving learning activities. In their book "Learning and Awareness", Marton and Booth (1997) detail how differences in experiencing can lead to what they call surface or deep approaches to learning; which in turn lead to more comprehensive ways of solving learning tasks. Such a relationship between variability in experiencing and forms of approaching are also dealt with within the book "University of Learning" by Bowden and Marton (1998). Such an association between variability in experiencing and approaching has also been explored within the field of DA development (e.g. Diehm and Lupton, 2012). Congruently, it can be affirmed that understanding students' forms of experiencing within the field of DA to approach IIA is of importance.

Given such importance, authors have invested efforts to better comprehend students' experiences. For example, Limberg (2000) *"studied students' various experiences of information seeking and use during a learning assignment in social studies"* (p. 59). Also, Diehm and Lupton (2014) carried out a study where they asked: *"What are the different ways students experience learning information literacy?"* (p. 4). Furthermore, in a related study, Diehm and Lupton (2012) also found that there were different approaches to learning how to interact with information (some deep and some surface), each associated with students' forms of experiencing the task. While there are more studies that explore experiences of IIA (e.g. Boon, Johnston, & Webber, 2007; Maybee, 2006, 2007), it is important to highlight that: not only are they scarcer when compared to other studies

that adopt what can be called a first-order approach (see Marton & Booth, 1997), and thusly fall short of studying experiences, but there are still important gaps within the existing literature.

Studies that focus on students' experiences of IIA do not focus on exploring the in-and-out-of-school facet simultaneously. The former gap is of importance given that there is literature that implies that students approach them differently, depending on whether one is within the in-school or out-of-school setting (see Erstad, 2012; Sefton-Green & Livingstone, 2016). Authors also stress that *"[w]e need greater understanding as to how learning takes place in various arenas, how these arenas dynamically interact, and how this affects the educational environments"* (Thomas et al., 2016, p. 3). In addition, none of the existing studies focus on Secondary Technical and Vocational Education and Training (S-TVET). For example, Diehm and Lupton (2014) explored university (undergraduate and postgraduate) students' experiences, Limberg (2000) senior-high-school students matriculated within the science concentration and Boon, Johnston, and Webber (2007) UK English academics. This apparent lack of focus on S-TVET is buttressed by the systematized literature review that was conducted within the framework of the present doctoral project (see Bolaños, Salinas, & Pilerot, 2022). One of the findings from this review is that, from a total pool of 613 articles, there is in fact a dearth of studies that focus on the intersection of digital ability development within classrooms and the S-TVET system. Such a lack of focus is disconcerting.

Even though it is stressed that DA are important regardless of the setting (e.g. school or leisure), it is explicitly mentioned that DA are indispensable for the modern work environment (see Care et al., 2015; Ferrari, 2013; Griffin et al., 2012; North Central Regional Educational Laboratory & Metiri Group, 2003; van Deursen & van Dijk, 2014). According to this assumption, for the modern workforce, DA are no longer optional, but a requirement. For example:

Students need to be prepared for new ways of working that will call upon their communication and collaboration skills. They will need to have a familiarity with new tools that include the capacity to recognize and exploit the potential of new technologies […] The employment that these students are likely to enter will increasingly require critical and expert thinking skills and complex forms of communication. It is for most countries a formidable economic problem to prepare graduates for this new kind of workforce. Those wishing to be highly rewarded in the workforce of the future will need to be expert at interacting with people to acquire information, to understand what that information means, and to persuade others of its implications for action (Care et al., 2015, p. vii).

In addition, the S-TVET system is the schooling system that is to prepare those students who wish to make a direct transition into the workforce. In the words of Chile's Ministry of Education:

S-TVET alludes to a specialized formation as is required by Chile's 14 economic sectors, distributed throughout 46 specialties. The competencies that students will be required to develop within S-TVET were defined in cooperation with entrepreneurial institutions, work unions, and government institutions; they respond to the growing necessity that Chile has of highly qualified human resources that are required by a burgeoning economy that is integrated into global markets (Ministerio de Educación 2009, p. 16).

Because S-TVET is the system assumed to be responsible for preparing students that wish to make a more direct transition into the workforce, and because of the assumed importance of DA within

such a workforce, studying students experiences of IIA, and their understandings of DA, at the intersection with S-TVET, is fundamental; yet it also has been scantly done.

In summation to this subsection: It is widely maintained that in today's knowledge society, IIA within digital environments is fundamental. To approach IIA, the enactment of DA is key. Congruently, developing DA within classrooms has become a priority for several school systems. However, students' DA development seems to be subpar, which hampers their participation within society and widens socio-economic and cultural gaps. For the development of DA, it is maintained that studying students' experiences of tasks that require their enactment (i.e. IIA) is of chief importance. Although there are studies that explore students' experiences of IIA, there are still important gaps within our knowledge of them. In particular, there is a scarcity of research that focuses on the intersection between digital abilities, the in-and-out of school facet and S-TVET.

III. DOCTORAL STUDY'S OBJECTIVE AND GUIDING RESEARCH QUESTIONS

To contribute to the current state of knowledge regarding IIA and DA, a general objective and specific research questions were designed, defended, and approved by an ad hoc doctoral commission (see Bolaños 2018, 2019). As was previously mentioned, the three articles included within this compendium tend to the general objective of the doctoral undertaking. Given the overall qualitative design (Creswell, 2014) adhered to when conceiving all of them, they all seek to offer an in-depth view of a particular phenomenon. In this case, S-TVET students' experiences of IIA, their enactment of DA while approaching IIA and their expressed understandings of such abilities (Table 3.1). To better understand, Table 3.1, a brief presentation of all articles will be provided.

Table 3.1. Article overview

General objective: comprehend the qualitatively distinct ways in which Chilean S-TVET students experience information interaction activities and their understandings of digital abilities, both within and outside of classrooms; as well as the relationship between these in and out school experiences.

Research article	Overall approach	Methodology	Method	Research question(s)
Literature Review[1]	Qualitative	Leaning towards a subjectivist and interpretative standpoint (see Lather, 2006; Lincoln, Lynham & Guba, 2017; Morrison, Manion & Cohen, 2007).	Systematized review (see Grant & Booth, 2009).	- According to empirical research, what instructional techniques (e.g., scaffolding, collaboration or problem-based learning) and tools (e.g. computers, tablets, books or storyboards) have purportedly been used by teachers to develop digital abilities?
Discourse Analysis Article[2]	Qualitative	Grounded in concepts derived from Laclau and Mouffe (see Laclau, 1990; Laclau & Mouffe, 2001).	Close-reading of a selection of policy documents. What was sought was articulation of signs into moments and myths (see, Laclau; 1990; Laclau & Mouffe 2001; Marttila, 2015).	-Is there a prominent myth within Chilean public policy documents that advocate for digital ability development within S-TVET classrooms? -What discourses are discernible within the analyzed documents? -What subjectivities are preferred within the analyzed documents?
Phenomenographic Article[3]	Qualitative	Relational-constitutionalist understanding (see Bowden & Green, 2005; Trigwell, 2000).	Phenomenography (see Marton, 1981; Marton & Booth, 1997).	-What are the qualitatively distinct ways in which S-TVET students experience IIA, both within and outside of school? -What are the distinct approaches that S-TVET students follow when dealing with IIA, both within and outside of school?

Article's title
1. Instructional techniques and tools reported as being used by teachers within empirical research focusing on in-class digital ability development: a literature review
   Authors: Bolaños, Salinas and Pilerot.
   Published by *Journal of Computers in Education* (SJR, Q2).
2. Digital abilities, between instrumentalization and empowerment: a discourse analysis of Chilean Secondary Technical and Vocational public policy documents
   Authors: Bolaños and Pilerot
   Published by *Journal of Vocational Education and Training* (SJR, Q1).

3. Secondary vocational education students' expressed experiences *of* and approaches *to* information interaction activities within digital environments: a Phenomenographic study
Authors: Bolaños and Salinas
Published by *Education and Information Technologies* (JCR, Q2)

3.1. Presentation of research articles

When writing the three articles within this compendium, I adhered to three distinct understandings of reality, of being (i.e. ontology). As such, I employed different methods to study such realities (i.e. epistemology). At all times, and understanding each research article as a distinct leg of the doctoral process, I was cautious to maintain research congruency and consistency between ontology and epistemology within each research leg (see Creswell, 2014). I was aware of debates of research incongruency and incompatibility between seminal authors used as guides during one leg of the journey and those used for the next leg. For example, phenomenographic principles (see Bowden & Green, 2005; González-Ugalde, 2014; Marton & Booth, 1997) would be in conflict with the understanding that there is one reality out there, ready for us to grasp; which can be argued to be the epistemological process I followed when writing the systematized literature review. Similarly, the onto-epistemological stance taken when writing the discourse analysis manuscript could be argued to be in contradiction with the phenomenographic manuscript (see Jørgensen & Phillips, 2002a,b; Laclau, 1990; Laclau & Mouffe, 2001). How, then, do three distinct and even possibly conflicting articles fit within a compendium that aims at offering a better understanding of the same phenomenon?

Paraphrasing Lincoln, Lynham, and Guba (2017, p. 230), at the paradigmatic or philosophical level, they do not fit. However, and still paraphrasing, they do fit if what is intended is to mix strategies in the pursuit of better comprehending a phenomenon. A sentiment that is echoed by other researchers such as Koro-Ljungberg (2015). She urges us to remember that "*research and*

findings can be more about meaning-making process than outcomes, more about questions than answers, more about connecting and living than arriving, and more about exploration than delivery" (Koro-Ljungberg, 2015, pp. 18-19). As was previously stated, in light of phenomenographic findings, an exercise in triangulaxivity (Koro-Ljungberg, 2015) was engaged with. Following such an exercise, it was decided that the use of different methodologies and methods was needed in order to better understand the ways that students' come to experience and express their understandings.

Because different methodologies and methods were selected so as to offer a more comprehensive understanding of students' experiences and understandings, commensurability (i.e., retrofitting one method so as to fit the paradigm assumptions of another) was not sought after. Such an attempt would have been inadequate. As has been argued, authors within each of the selected methodologies could be argued to openly reject the other. As such, what would be key would be to guarantee methodological and method congruency within each step of the doctoral process, be transparent of such decisions and describe each research venture as what they are, three different windows that offer insight into a complex phenomenon (Koro-Ljungberg, 2015; Lincoln, Lynham and Guba, 2017). Notwithstanding, they are all joint in the fact that as an overreaching approach they all favor qualitative approximations (Creswell, 2014); and, in their broadest understandings, could be argued to share threads at the boundary of an interpretivist research paradigm, e.g.*, reality is many*, *subjective* and *constructed* (Lincoln, Lynham & Guba 2017). What will follow is a more detailed description of each article.

3.1.1. Methodology and methods

For the presentation of the research articles, considerations regarding ontology, epistemology, methodology as well as methods will be interweaved. Ontology is related to the nature of what is considered to be *reality*, while epistemology is concerned with how one approaches such a reality (Creswell, 2013). Taking inspiration from Willing (2013), a methodology is understood to be the approach taken while studying a phenomenon, while methods are the specific research techniques. Whilst there has to be a coherence between these last two, they are not the same. For example, phenomenography is a research method that builds on the understanding that experience is posited in a relational manner between individuals and their surroundings, and as such conversing with individuals is the preferred method (Bowden & Green, 2005; Trigwell, 2000).

There are many approaches that can be taken when studying a particular phenomenon. For instance, any phenomenon can be questioned ontologically (i.e. questioning what it *is*), which could lead to the proposition of new ways to study it (i.e. epistemology). For example, DA can be questioned ontologically: are they competencies or skills? Determining whether they are one or the other is of importance, for developing a competency need not be the same as developing a skill (see Woolfolk, 2010). One can also question how it is that a phenomenon became an entity infused with significance and therefore important to be studied. If this were the case, then one could study the discursive rules that coexist within a particular field and that work together to fix certain truths (see Howarth & Stavrakakis, 2000; Jørgensen & Phillips, 2002). Yet another way to study phenomena is to accept its existence, as well as its importance, and proceed to search for gaps in current knowledge (see Boote & Beile, 2005).

In contrast to both other articles, the approach (methodology) taken when drafting the Literature Review is not as easily graspable. A reason for such inconveniency rests within the fact that a literature review is a method, a method of which multiple varietals exist (see Grant & Booth 2009). By means of a literature review certain texts are extracted, and then one can proceed to perform a diversity of analyses. For example, within the extracted texts, one can choose to study discursive rules within them or, as another approach, one can rather choose to apply statistical methods to find overarching trends within them. One of these approaches, generally speaking, could be argued to lean towards an *antipositivist* approach while the other inclines towards a *positivist* approach (Morrison, Manion, & Cohen, 2007). Because a literature review is a method, methodological issues surrounding a literature review can become trickier to identify.

The literature review presented within this doctoral compendium sought multiplicity in both the ways of understanding digital abilities and in the forms of developing such abilities (see Bolaños, Salinas & Pilerot, 2022). It likewise searched for the use of methods within research articles that could give rise to students' voices, and thusly once again sought plurality of understandings (see Bolaños, Salinas & Pilerot, 2022). As such, it could be argued that the review adhered to certain principles of an antipositivist approach (see Morrison, Manion, & Cohen, 2007). However, all findings were collapsed into one conception of digital abilities, and then findings were presented as a graspable reality (see Bolaños, Salinas & Pilerot, 2022). When drafting the Literature Review, the goal was to adhere to strict methods so as to capture, with fidelity, reality. Furthermore, the embarked-on quest when conducting the review was on categorizing what is known about *this real thing* (i.e. DA) and finding existing gaps in knowledge. The quest was not– for example – exploring *why* DA have been articulated as important (see Bolaños, Salinas & Pilerot, 2022).

Thusly, it can also be argued that I pursued to be *scientific in the approach* (Lather, 2006) and sought to follow certain principles that would slant towards a positivist approach (see Morrison, Manion, & Cohen, 2007). There are elements, then, that render it difficult to place the Literature Review neatly into a research paradigm.

Perhaps a better way of tackling the issue would be to ask the question at two different levels: the ontological and the epistemological. At the ontological level, when conceiving the review, I understood reality as *subjective*, *constructed* and *many* (i.e., an interpretivist research paradigm, see Lather, 2006). However, epistemologically, the approach taken would seem to be more in line with attempting to find reality, capturing it with fidelity and offering recommendations based on that reality (i.e., a positivist research paradigm, see Lather, 2006). All things considered, though, and understanding that the review is likewise conceived as one of the windows within this eclectic compendium (one which aims to offer multiple views of phenomena), I would argue that the Literature Review leans closer to a subjectivist and interpretative stance (Lather, 2006; Lincoln, Lynham, & Guba, 2017; Morrison, Manion, & Cohen, 2007).

For the review, Web of Science (all collections) was selected. The search for articles was initiated on March 28 (2020). Furthermore, an alert was created so as to allow us to receive weekly updates of published articles. The extraction of articles was ended on the 24th of April 2021. Out of 613 total articles, 17 were untimely selected for analysis.

As was previously mentioned, the Literature Review provides a peek into how DA to approach IIA have been developed within classrooms as reported by academic research. Such a glance allows one to infer how students' experiences of IIA and the development of DA to approach them

have been studied. Having such a silhouette, it was decided that understanding how public policy and other normative documents understand, articulate, and *fix* (Laclau, 1990; Laclau & Mouffe, 2001) IIA and DA within classrooms' settings was of equal importance. After all, such normative documents can spill into classroom activities via translation (Perryman, Ball, Braun, & Maguire, 2017) and thusly impact students' experiences and understandings.

The Discourse Analysis article adheres to a postfoundational understanding (see Marttila, 2015). When conducting such an analysis, we employed concepts derived from Laclau and Mouffe (Laclau, 1990; Laclau & Mouffe, 2001). Because people learn to see, consent and validate what is acceptable and what is not through the existence of regimes of truth (Foucault, 1980b), individuals tend to push away from their view, their field of awareness, those behaviors and patterns of ideas that are regarded as unwanted for a society (Foucault, 1980a). Furthermore, by equally complex and interwoven relationships of power, societies have been able to establish mechanisms by which these manners of viewing and experiencing can be replicated and thusly, how truths are established as facts and subjects can be governed (Gordon, 1991; Laclau, 1990; Laclau & Mouffe, 2001). Thus, realities, or worlds, are given rise within discursive relationships (Jørgensen & Phillips, 2002a; Laclau, 1990; Laclau & Mouffe, 2001). These allow for the emergence, as well as concealment, of subjectivities (i.e. allowed positions for subjects) from where subjects are assumed to display a set of desirable behaviors (Howarth & Stavrakakis, 2000; Jørgensen & Phillips, 2002b). Reality is ultimately unknowable and un-fixed, *truths* are articulated and re-articulated and discourses are inseparable from subjects (Jørgensen & Phillips, 2002a; Laclau, 1990; Laclau & Mouffe, 2001; Lather, 2006). As such, the analyst must remain within discourses; that is the location from where it is possible to describe the positions and functions that a subject could occupy, the rules of existence through discourse, and the choices that it would allow (Jørgensen &

Phillips, 2002b). In total, five public policy documents central to Chile's Secondary Technical and Vocational Education and Training (S-TVET) system underwent discourse analysis.

As was found by the Literature Review, students' experiences, as expressed by them, are seldom given rise within the field of in-class DA development. As such, we decided to employ a relational-constitutionalist understanding (see Bowden & Green, 2005; Trigwell, 2000) when attempting to seek a closer understanding of students' experiences. That is, what was deemed important was to explore how students experience an IIA, how they approach such an IIA, and how they come to express their understanding of the DA enacted while approaching an IIA. It was also decided that such exploration had to focus simultaneously on the in-school and out-of-school worlds, which is seldomly done within the field of in-class DA development. Finally, shying away from an intervention and seek to better comprehend students' experiences within a habitual classroom activity was also decided to be preferable given the scarcity of such research within the field of in-class DA development. Finally, we favored the world of students matriculated within the S-TVET system. As a method, we preferred phenomenography.

Such a method was chosen because for phenomenography the object of study is *how* phenomena is experienced by individuals (Bowden & Green, 2005; González-Ugalde, 2014; Marton & Booth, 1997). Phenomenographic studies build on the understanding of experience as comprehended by phenomenology (Marton & Booth, 1997). We are beings in a world and reality is posited through the interaction between individuals and their ever-enveloping, and not fully reachable, surroundings (Husserl, 1962; Merleau-Ponty, 2002, 2004). Phenomenographic principles dictate that researchers seek to comprehend the qualitatively distinct ways in which a group experiences the same phenomenon (Marton & Booth, 1997; Marton & Pong, 2005). It requires that researchers

employ second-order perspective methods (González-Ugalde, 2014; Marton & Booth, 1997) such as semi-structured interviews. In addition, when researchers attempt to bolster the credibility and trustworthiness of their findings they can, for example, use investigator triangulation. Importantly, though, knowledge/reality – or better said *true* knowledge/reality – does not exist under phenomenographic principles, it is an interpretative research paradigm (see Bowden & Green, 2005). For phenomenography, there is no such thing as one truth. In the words of Lather (2006, p. 38), regarding interpretivist paradigms, "reality is subjective and constructed [and] truth is many". By means of purposeful sampling, a total of 24 S-TVET students participated in the study. They were matriculated within two different schools within the Metropolitan Region of Santiago; and came from a total of three specialties: Accounting, Tourism and Industrial Elaboration of Food Products. All conversations were held between May and August 2019.

Three manuscripts, written during three different moments of the doctoral process. Despite adhering to different understandings of reality when drafting each of the manuscripts, and therefore employing different methods to study such an understanding of reality, they all work in conjunction to offer a better comprehension of the qualitatively distinct ways in which Chilean S-TVET students experience IIA, how they approach such an IIA and how they express understanding DA, both within and outside of classrooms. Reiterating, they can be thought of as being three different windows designed and grafted with different materials and positioned at different angles, but all notwithstanding offering a view onto the same phenomenon.

IV. STUDY'S SITE

4.1. Why favor Chile's S-TVET system?

Chile's S-TVET system was primarily chosen for four reasons. Firstly, Chile's government officials have assiduously and without interruptions advocated for ICT integration and/or digital ability development within their classrooms. Not only has Chile's government pushed for ICT integration throughout seven presidential administrations – ranging from all over the political spectrum (Bellei et al., 2010) – but they have also had specific, and ongoing, policies that guide digital ability development within classrooms (Enlaces, 2016). Such efforts have been coordinated in large part by Enlaces, a branch of Chile's Ministry of Education tasked with digital ability development. Secondly, in Chile, S-TVET is the system responsible for preparing secondary students that wish to make a direct transition from secondary-school into the workforce (Castro & Orellana, 2010; Montero, 2016). Thirdly, it matriculates a significant percentage of the entire student population. As of 2019, 37.4% of all enrolled secondary students were matriculated within S-TVET (Sepúlveda, 2019). Fourthly, within Chile, all S-TVET specialties are specifically conceived as requiring the development of competencies that would *"allow for the adequate use of information communication technologies to process pertinent information and to communicate results, instructions and ideas"* (Ministerio de Educación 2016, p. 13). Additionally to the previous four reasons, children enrolled within Chile's S-TVET schools come from some of Chile's most economically challenged families (Buitrón, 2011; Sepúlveda, Ugalde, & Campos, 2009) and, lastly, even Chile's Ministry of Education recognizes that there has been far less studies focusing on S-TVET than on its brother system, Scientific and Humanity Education (Buitrón, 2011).

4.2. Chile's S-TVET system, an overview

Even though Chile has had a conception of TVET that dates as far back as 1849 (Corvalán & Santibañez, 1987), for the purposes of this study the year 1965 will serve as a starting point. The current understanding of Chile's S-TVET school system finds its roots in Chile's 1965 educational reform (Cariola, 1995; Castro & Orellana, 2010; Gobierno de Chile, 2018; Ministerio de Educación Pública, 1965). Prior to 1965, S-TVET was not considered to be equivalent to secondary education and, furthermore, was nonconductive to tertiary education (Corvalán & Santibañez, 1987; Fuentealba et al., 1961). Chile's 1965 Reform established that S-TVET was not to be a parallel option to secondary education but part of it (Ministerio de Educación Pública, 1965). It established secondary education in Chile as having two modalities: secondary education with a focus on humanities and sciences and technical and vocational education and training (Ministerio de Educación Pública, 1965). Furthermore, it also established that students that so wished could move freely between these two modalities (Ministerio de Educación Pública, 1965).

Although there have been modifications and amendments to the 1965 conception of S-TVET, the overall structure designed by the 1965 educational reform is still present to this day (Cariola, 1995; Castro & Orellana, 2010). Arguably three of the most important alterations to the 1965 conception were brought about by the 1998 curriculum framework, the adjustments to the aforementioned curriculum in 2009, and the new curricular basis of 2013 (Montero, 2016). These last ones were up to the year 2019 still the ones that regulated and operationalized Chile's S-TVET. The former stated, notwithstanding, the 2013 curricular bases were complemented by DTO (Spanish acronym meaning Legal Decree) 954 (2015) and DTO 1.246 (2016), which established minimum courses to be covered within S-TVET. Another important milestone for S-TVET was the approval, during

the year 2003, of Law 19.876 (Ministerio de Educación, 2003). This law established that secondary education, and not only basic education, was to be compulsory; and that, therefore, the State was required to offer the population possibilities so that they could attend such a system in a gratuitous fashion.

As of the writing of this compendium, and according to the Chilean National Curriculum (2009), within Chile, all students must study eight years of primary education (Ministerio de Educación, 2009). On average, students attend these eight years from the ages of 6 to 13. Following these, they study two years of general secondary education (Ministerio de Educación, 2009), from ages 13 to 15. Then, students choose between Scientific and Humanity Education – which is intended for those that wish to continue their studies within the university system – or Secondary Technical and Vocational Education and Training for those that wish to make a more direct transition into the workforce (Ministerio de Educación, 2009). For these last two years, students are on average between 16 and 18 years old; however, it is not uncommon for S-TVET students to be of up to 19 years of age. Within Chile's S-TVET, students can choose between 46 specialties (e.g. accounting, mechanical engineering, mining, and tourism) (Ministerio de Educación, 2009).

V. ARTICLES

5.1. Article 1. Instructional techniques and tools reported as being used by teachers within empirical research focusing on in-class digital ability development: a literature review

Authors: Fernando Bolaños, Álvaro Salinas and Ola Pilerot

Abstract

Despite vast amounts of existing research regarding digital ability development, there is a dearth of studies that systematize and evaluate the instructional techniques and tools reported as being used to develop them. The aim of this study is to contribute to the state of knowledge regarding the instructional techniques and tools reported as being used by teachers to develop digital abilities. To such an end, a systematized literature review was conducted. For the extraction of articles, a specific search code was used within the Web of Science All Collections, including SciELO, databases. Without setting a year-limit, and concluding the search on the 24 of April 2021, 613 articles were found. Sixty cleared selection criterion and, ultimately, 17 contributed to the purpose of the review. Findings show that a majority of articles report on classroom interventions and not on classroom observations. Additionally, they also suggest that six instructional techniques were employed by all studies: analysing multiple perspectives of a same learning assignment, using authentic problems, collaboration, providing feedback, giving progressive autonomy to students and asking them to share their work. Regarding methodology, a preferred approach is the use of pre-post test design with a small number of cases and where non-probabilistic sampling and selfreported questionaries are favoured.

Key Words: 21st century abilities; teaching/learning techniques; digital abilities; literature review

5.2 Article 2. Digital abilities, between instrumentalization and empowerment: a discourse analysis of Chilean secondary technical and vocational public policy documents

Authors: Fernando Bolaños and Ola Pilerot

Abstract

It is argued that developing digital abilities is key for today's knowledge society. They facilitate engaging with pervasive information communication technologies and manipulating information. Governments have invested vastly in formal education aimed at developing digital abilities. Policies and directives driving this venture need to be examined. Otherwise, their potential risks being thwarted. Grounded in concepts derived from Laclau and Mouffe, five public policy documents central to Chile's Secondary Vocational Education and Traning (S-TVET) system underwent a synchronic heuristic discourse analysis as understood under relational-ontology. Findings indicate that all analysed documents are articulated with a myth of an information society. Additionally, two prominent discourses were identified: an instrumentalization discourse and an empowerment discourse. When referencing S-TVET, however, the most salient discourse is that of instrumentalization. Instrumentalization discourses render digital abilities under a narrow corporate fixed set of decontextualised skills, and risk thwarting their potential.

Keywords: Secondary Technical and Vocational Schooling; discourse analysis; educational technology; digital abilities

5.3. Article 3. Secondary vocational education students' expressed experiences *of* and approaches *to* information interaction activities within digital environments: a phenomenographic study

Abstract

It is argued that today is an information driven society. Being able to engage digital information abilities to solve an information interaction activity within digital environments is key for social participation, equality and for bridging socio-economic and cultural gaps. Developing these abilities within school classrooms has become a priority. However, research suggest that a majority of students can only complete basic and explicit information-gathering and management tasks within digital environments. Literature constantly holds that students' expressed experiences of information interaction activities are key for developing digital information abilities. Notwithstanding, there are still important gaps within our understanding of students' expressed experiences of them. To address such gaps we employ phenomenography to study Chile's Secondary Technical and Vocational Education and Training students' expressed experiences of information interaction abilities; a group that has likewise been overlooked. By means of purposeful sampling, a total of 24 students participated in the study. Focusing on both the out-of and in-school settings, findings suggest that the apparent clear-cut division between the out-of and in-school experiencing seems not to be as pristine as some might suggest. Findings also indicate that specialty courses, as they are currently designed, might not be favorable for developing digital information abilities as well as pointing towards the importance of situating students' expressed experiences within wider discourses surrounding digital ability development.

Keywords Information digital abilities. Phenomenography. Technical and vocational education and training. Information interaction activities.

VI.   ARTICULATION OF FINDINGS

Table 6.2 groups key findings from all three research articles. All three articles provide a peek into a so-far underexplored, but articulated as very important, intersection of digital ability development. In addition to these findings, and in an overarching manner, I would like to stress that throughout four years of doctoral studies I have yet not found any manuscript that explores digital ability development within classrooms at the cross-section of students' experiences, the in-and-out facets and S-TVET. Students' experiences, as well as the S-TVET schooling system, are articulated as being of significant importance; yet there seems to be an oversight in considering them.

Concerning students experiences as expressed by them, there are only two studies that use student interviews when exploring techniques for DA development within classrooms (Bolaños, Salinas and Pilerot, 2022). Moreover, within these studies, researchers only conversed with a subgroup of the student population with whom they worked with (Bolaños, Salinas, & Pilerot, 2022). Such a finding could explain why this doctoral study found that the supposed division between the in-school and out-of school experiencing (see Erstad, 2012; Sefton-Green & Livingstone, 2016) might not be as clear as is suggested. Because students' voices have been missing from academic research, we have an incomplete portrait as to why these two worlds might be seen, by teachers and other adults related to the educational field, as being different. Even more, studies that do privilege students experiences as expressed by them (e.g. Diehm & Lupton, 2014; Limberg, 2000; Maybee, 2006, 2007) do not explore, in a simultaneous fashion, the in-and-out worlds; once again leading to an incomplete portrait of students' experiencing within such settings. Findings for this doctoral study indicate that within students' seven total forms of experiencing (Table 6.2, for more

detail see Bolaños & Salinas, 2020) there are clear similarities between the in-and-out-of-school setting.

It is true that student interviews are not the only way of exploring students' experiences (see Bolaños & Pilerot, 2021). Given that "in a way we are nothing else but what has been said, centuries and months and weeks ago and so on" (Foucault, 1978, p. 11), experiences, as well as the accepting of things as valid, are imposed onto people (Foucault, 1990a, 1990b). To understand experiences, then, one can study discourses. Studying them can reveal how certain forms of experiencing are privileged while others are obscured. However, while there is literature that explores discourses related to digital ability development within classrooms as presented by public policy documents, pedagogical manuals, and other curricular documents, there is a shortage of focus on the S-TVET system in particular (Bolaños & Pilerot, 2021). Furthermore, even though DA development is presented as key within public policy and other normative documents, there is a dearth of research that explores how these are developed within the habitual routine of a classroom (Bolaños, Salinas & Pilerot, 2022). As such, it can be argued that there is an incongruency between existing rhetoric surrounding DA development within classrooms and research. Incongruency that is even more salient given that, so far, no studies that focus on DA development at the intersection S-TVET have been found.

This doctoral study, however, is in congruency with authors (e,g. Cuban, 2001; Hanell, 2018; Nivala, 2009; Selwyn et al., 2001) that argue that discourses concomitant to DA development, IIA and ICT integration can present an oversimplification of phenomena and where several so-argued key concepts are not fully unpacked. For example, the myth (see Laclau, 1990; Laclau & Mouffe, 2001), of an information society is bluntly accepted by normative documents that address DA

development to address IIA within the S-TVET system (Bolaños & Pilerot, 2021). Also, what such a society is meant to signify is not only not questioned by such documents, but it is not properly defined and the understanding of it is not fully articulated. As such, the question posed by authors such as Hanell (2008) (i.e. whether DA and ICT policies intend to solve economic, labor or educational problems) is found to be an unaddressed one. In the same line, another oversimplification has to do with the fact that DA can risk being interpreted as only those related to the usage of ICT (see van Laar et al., 2017). Findings as presented within the Discourse Analysis manuscript suggest that within S-TVET, corporate and entrepreneurial institutions are the ones that are to decide what a DA competent student is to be; and while such companies might want their employees to be digitally competent, they might take this to mean *getting the job done*. Thusly, purposefully engaging with information so as to scrutinize and transform it is not essential. A finding that is buttressed by the fact that students do express that within S-TVET courses, critically interacting with information so as to vet the quality of it is not a necessity (Bolaños & Salinas, 2020).

Continuing with the study of discourses, the prevalence of an instrumentalization discourse (see Bolaños & Pilerot, 2021) could provide insight as to why students apparently perform poorly in DA evaluations. Might it not be that they are not performing poorly, but rather performing as best they can (given the manner in which DA development is envisioned by public policy documents)? While true that there need not be a direct translation between policy and classroom activities (Oyarzún, 2020; Perryman, Ball, Braun, & Maguire, 2017), students' experiencing of IIA does suggest that they in fact see no need to be critical towards IIA within the space of specialty courses as they are currently designed (Bolaños & Salinas, 2020), as has been previously remarked. In line with a possible instrumentalized understanding of DA, the conducted literature review (Bolaños,

41

Salinas, & Pilerot, 2022) also found that the majority of existing research only employs ICT while attempting to develop DA. As was argued in the discussion of the literature review, DA are not only those related to the usage of hardware and software. Congruently certain abilities subsumed under the category digital abilities, those that are not new (see Griffin et al., 2012; van Deursen & van Dijk, 2014) and that can be disarticulated form ICT as tools, could be taught and developed even in the absence of ICT and the internet – as was argued in the Literature Review (see Bolaños, Salinas, & Pilerot, 2022). Not taking advantage of such an opportunity might further provide clues as to why students' current DA development seems to be lackluster. Continuing with possible outcomes of an instrumentalized understanding, even though DA are context-dependent, this was also found to be an area that requires further stressing within existing research that advocates for DA development within classrooms. Within the reviewed empirical studies that investigate DA development (see Bolaños, Salinas, & Pilerot, 2022), there seems to be a lack of moments where students can reflect between possible linkages between DA and more traditional abilities, as well as the multiple areas where DA can be employed and where they could flourish in relation to these traditional abilities.

Table 6.2. Key findings

Article's guiding research question(s)	Findings
Literature Review According to empirical research, what instructional techniques (e.g., scaffolding, collaboration or problem-based learning) and tools (e.g. computers, tablets, books or storyboards) have purportedly been used by teachers to develop digital abilities?	- The used techniques for developing digital abilities are in congruency with suggestions set forth by texts that provide proposals for their development. - A majority of articles report on interventions and not on classroom observations, which limits our understanding of how digital abilities are developed within the habitual routine of a classroom activity. - There are also limitations regarding study design, sample population and methods used to test the efficacy of interventions. - There is little exploration of alternatives for developing digital abilities by means of tools other than ICT; as such, these technologies are presented as a requirement for their development.

	RQ1: What are the qualitatively distinct ways in which S-TVET students experience IIA, both within and outside of school? RQ2: What are the distinct approaches that S-TVET students follow when dealing with IIA, both within and outside of school?	- Within school, students express experiencing an IIA in three hierarchically related forms. - Outside-school, there are four distinct hierarchically related forms. - For both settings, students express three different, likewise hierarchically related, approaches towards IIA. - The apparent clear-cut division between the out-of and in-school experiencing seems not to be as pristine as some might suggest. - Specialty courses, as they are currently designed, might not be favorable for developing digital information abilities. - It is necessary to situate students' expressed experiences within wider discourses surrounding digital ability development.
Phenomenographic Article		
Discourse Analysis Article	RQ1: Is there a prominent myth within Chilean public policy documents that advocate for digital ability development within S-TVET classrooms? RQ2: What discourses are discernible within the analyzed documents? RQ3: What subjectivities are preferred within the analyzed documents?	- All analyzed documents articulate an information society as a myth. - Two prominent discourses were identified: an instrumentalization discourse and an empowerment discourse. - When referencing S-TVET, the most salient discourse is that of instrumentalization. Instrumentalization discourses render digital abilities under a narrow corporate fixed set of decontextualized skills and thusly risk thwarting their potential.

The presented articles within this compendium, provide less insight into students' forms of understanding and expressing what DA are for them, both within and outside of classrooms. Such an exploration was to be addressed by means of a manuscript drafted for an international conference. Such a manuscript proposal was accepted by the *2020 European Conference on Educational Research, Network 02-Vocational Education and Training (VETNET)*. Due to the ongoing Covid-19 pandemic, though, such a conference was canceled and the manuscript was never finalized. In the following lines, however, key findings of such an unpublished manuscript will be given.

It was notoriously difficult for students to verbalize their understandings of DA. This could be further indication that there is a lack of moments, within the habitual course of a classroom activity, where students can reflect on the enactment of DA. Even students within the most comprehensive categories of experiencing and approaching IIA (see Bolaños & Salinas, 2020), expressed difficulty in doing so. For example, St1:

Q: And, thinking about the abilities, the things that I need to be able to do, to do what you do, what would you say that they are?

Answ: Ehhh, no, no, I would not know, well, like, well, no I would not be able to say.

Through an iterative process of asking students to retell their experiences of IIA, the approaches taken when solving them and then probing how they understood the abilities used, students were able to express their understanding of DA. However, because of such an iterative process, the in-and-out of school setting became muddled. What students commented to be their understanding of DA applies to DA in a general fashion and not specifically for the in or out of school facet. Conversations indicate that there are a total of four different forms in which students express what they understand DA to be, which can be seen in Table 6.3.

Table 6.3. Students expressed understandings of DA

Students' Understandings of DA			
A	B	C	D
Soft abilities	Traditional abilities	Sorting abilities	Hardware/software & Internet abilities

While I agree with authors (e.g van Deursen & van Dijk, 2014) who argue that hardware/software abilities and internet abilities are not the same, I have nonetheless chosen to place them in tandem within category D. The reason is twofold: yes, students did mention them separately, but all students that mentioned one also cited the other. Thus, and this is my second reason, it seemed practical to place them together in the lowest, hierarchically speaking, category; it would allow for a cleaner representation of the outcome space. For example, St17 commented that:

I told her, mom, look, it's very easy, I told her, like that, you push a small button,

and then with your hand you move this [mimicking a mouse], and, and, like that,

explaining step by step in as simple way as I can. Sometimes it's funny, but it's

entertaining. I told her "mom you have to use the arrow you see there, that one",

and she tells me, "yes, yes". And then I say, "if you want to close something,

you push here. Or, when you want to open a page, you push a circle with a G,

like G for gecko. Then, you enter the page and then, you start to write what you

want to look for", I tell her, "you write with the letters, those black ones on the

computer, then you choose the video you want by using the magnifying glass

icon" (St17).

I decided those sorting abilities (i.e., knowing how to narrow one's search and how to sift through information) was to be the next sequential hierarchy given that it is still circumscribed to ICT and the internet. However, expressing that DA are also traditional abilities, such as having reading comprehension and writing skills, involves a greater awareness of what DA are as well as detaching oneself from the *solely ICT tool* point of view. Finally, few students also stated that DA are abilities such as having perseverance and courage to follow one's own ideas (labeled here as soft abilities). This was decided to be the highest sequential hierarchy of expressed understandings of DA. Regarding this last category, for example, St15 stated that: *"[One also needs] like, ehhh, willpower. Because one can, like, for example, set a goal, but everything comes with willpower, with the amount of energy and umph that one wants to dedicate to that particular goal"*.

It is important to state that several students do comment that DA outside of schools and inside of schools are the same. For example, when asked if the abilities needed to interact with information

varied between the in and out of school, St13 commented that: *"No, I believe they are the same. Because, one has to be able to read, write and to look for things in both"*.

Relatedly, when speaking about the differences and similarities regarding being able to use the Internet and look for information, St2 stated that:

> [within and outside of school] I would say that they are the same…the thing is that, in school and outside of school, one looks for the same things, and, ehhh, I mean in school one also uses WhatsApp and Instagram, one doesn't only do projects. And at home it's the same, at home one also does projects and uses WhatsApp and Instagram.

In total, six students pointed towards such similarities between DA within and outside of school settings: This finding is of special interest when coupled with the fact that, as was presented within the Phenomenographic Article, there are also 12 students that experienced IIA similarly within and outside of school (Bolaños & Salinas, 2020). As was argued during such an article, the apparent clear-cut division between the in-and-out of school facet (as some others argue, see Bolaños & Salinas, 2020) seems not to be so pristine. There is, therefore, important opportunities for *bridging* (Thomas et al., 2016); as was also debated throughout the Phenomenographic Article.

If efforts are to be made to integrate students out-of school experiences and in-school experiences (and worlds), then there is a need to complement current understandings of DA and IIA with students' voices. It seems that the current understandings of DA have preponderantly emanated from researchers, interest groups or intergovernmental organizations and not from the students that are to engage them. Once again, this finding seems to be buttressed by the lack of student

interviews used within empirical studies that focus on DA development within classrooms (see Bolaños, Salinas, & Pilerot, 2022). As an example of understandings as presented by so thought international experts, the ATC21S framework was spearheaded by technology moguls Cisco, Intel and Microsoft (Griffin et al., 2012). Furthermore, importing the findings from frameworks has consequences that are far from whimsical (Bolaños & Pilerot, 2021). This doctoral study does not question the value of understandings of abilities as set forth by researchers, interest groups or intergovernmental organizations, but it does contend that they provide an incomplete portrait. One that, as authors argue, needs to be scrutinized (see Bowden & Marton, 1998; Pilerot & Lindberg, 2011). Thus, studying students' understanding is important for it complements the current knowledge of DA. In this sense, this doctoral study is wanting. It devoted far fewer resources to such an exploration.

VI.1. Further explorations

Evidently, a further area of exploration would be to devote more resources to students' understanding of DA. The found understandings seem to echo understandings as set forth by researchers, interest groups and/or intergovernmental organizations. Here, for example, applying discourse analysis (see Bolaños and Pilerot, 2021) might prove advantageous: What are the discursive rules that allow for certain understandings to be given privileged appearance? Still on the topic of discourse analysis, and given the relatively small number of articles extracted in the process of conducting the literature review, it would be productive to subject these to discourse analysis: what are the discursive rules within the production of academic knowledge that have made certain techniques and tools seem as conducive to developing digital abilities within classrooms?

Still on the topic of discourses, while conducting the Discourse Analysis study, indications that Chilean rural communities have been neglected by academic research cropped-up (see Oyarzún, 2020). In addition, and as is detailed by Oyarzún (2020), rural communities intersect in more ways than one with S-TVET. As such, it is desirable to replicate certain aspects of the doctoral study, but now focusing on the cross-section between rural S-TVET schools and DA development. As was suggested in the research articles written for this doctoral compendium, if governments in fact intend for DA to be contributors of social inclusion and wellbeing, then discourses comprising DA development must be examined. If not, the existing potential of DA development risks being thwarted; and where can such a risk be greater than in communities that have been neglected. However, while public policy discourses allow for the appearance of certain subjects and warrant certain behaviors, students might situate themselves within them or not (see Oyarzún, 2020). As such, conducting interviews with students in order to explore their experiences in relation to the two dominant discourses (i.e. instrumentalization and empowerment) would be of importance. While on the topic of the prevalent instrumental discourse that is found within the Chilean S-TVET system, it would be important to continue the exploration of curricular documents that more closely detail classroom activities and interventions for S-TVET. Also, it would be likewise important to explore what a good or ideal S-TVET student subject is, by examining specific curricular activities and classroom sessions (see Bradbury, 2012). Addressing such questions regarding discourse could contribute to addressing the oversimplification that can be found regarding key understandings articulated to the information and knowledge society.

Also in an attempt to mitigate such an oversimplification, it would also be enriching to continue the exploration of student's forms of experiencing, approaching and understanding within specialties that might be more inclined to develop critical interacting with sources (e.g.

journalism). Finally, and taking advantage of the phenomenographic method, it would be recommendable to conduct studies so as to find ways of bridging the in-school and out-of school settings (see Thomas et al., 2016). Could we take advantage of strategies that students employ to vet information when perusing their personal interests and adapt them to vetting information within school? What would this do for, as an example, motivation?

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