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THE NATIONAL CURRICULUM FOR BASIC EDUCATION AS A TOOL TO PROMOTE DIGITAL LITERACY: RECOMMENDATIONS FOR CHILE BASED ON THE ESTONIAN EXPERIENCE

MA Thesis

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Abstract

This thesis, “The National Curriculum for Basic Education as a Tool to Promote Digital Literacy: Recommendations for Chile Based on the Estonian Experience”, explores Estonia’s pioneering approach to digital education and provides recommendations for Chile to enhance its digital literacy efforts. Estonia has gained global recognition for its progressive curriculum based in digital literacy, while Chile focuses more on addressing social inequalities in education. This thesis analyzes public policies, the concept of digital literacy and compares national curricula between both countries. Based on these insights, recommendations are formulated to improve Chile’s digital literacy initiatives, ensuring quality education aligned with the demands of the 21st century.

Keywords: *Digital Literacy*; *National Core Curriculum*; *Public Policy in Education, Digital Competence.*

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1. Introduction

Since its independence in 1991, Estonia has emerged as a pioneer in the domain of digital innovation, earning the reputation of an "e-nation" (e-Estonia, 2023). Estonia has particularly excelled in its progressive approach to digital education. The country has gained global recognition for its forward-thinking strategies and initiatives to equip students with digital skills. From an early age, Estonian students are exposed to technological devices and encouraged to develop digital literacy, acknowledging the increasingly significant role of technology in various aspects of modern life.

Estonia's educational system offers flexibility in its curriculum, allowing for personalized and relevant learning experiences tailored to meet the needs and preferences of individual students in the 21st century. This adaptability fosters a dynamic educational environment that prepares young people for a digitally driven future. The *Organization for Economic Cooperation and Development* (OECD) reports that nearly 70% of Estonia's curriculum is dedicated to digital literacy, distinguishing it as a leading proponent of these crucial skills (OECD, 2021, p.24).

In contrast, Chile has prioritized public policies in education that aim to bridge social gaps and provide quality education for all, with less emphasis on digital education as a practical tool to achieve these goals.

This research focused on public policies in education, the globalization of these policies, and the general characteristics of the Estonian and Chilean educational systems in order to compare the approach of both countries to digital education. Moreover, the concept of digital literacy was examined in depth, considering its significance and implications for contemporary education. Furthermore, global concerns and expectations surrounding digital literacy and digital competencies were explored. Consistently, an analysis of the national curricula for basic education in Estonia and Chile was conducted to discern their perspectives on digitalization and digital literacy as a central topic in 21st-century education. The general objective of this research was to conduct a comparative study of the current national curriculum for basic school in Estonia and Chile answers to the following research questions:

1. What is Digital Literacy's role in Estonia and Chile's national curriculum?
2. How is that role associated with the Digital Literacy level of learners in Estonia and Chile?
3. To what extent can the National Core Curriculum play a positive role in fostering learners' Digital Literacy?

As a culmination of this study, recommendations were formulated for the Chilean state, guided by learning expectations and the continuity of public policies. These recommendations aim to enhance the digital literacy of Chilean students, thereby delivering quality education that aligns with the demands of the 21st century.

2. Theoretical Overview

This section provides the theoretical overview required to conduct this research. First, the national core curriculum is defined as public policy. Second, the concept of digital literacy is presented. Third, the role of the national core curriculum in promoting digital literacy is explained. This section shows an overview of the national core curriculum of Estonia and Chile.

2.1. The National Core Curriculum as Public Policy

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The subsections that follow explain the concept of public policy to understand the national core curriculum as a form of public policy. In addition, the global perspective on public policies in education is presented.

2.2. Public Policy and Comparative Public Policy: Concept and Analysis

Public policies are the courses of action and information flow that aim to a political goal, whose definition is desirable to be done democratically. Accordingly, analyzing a public policy includes taking into consideration all the guidance, contents, instruments, mechanisms, definitions, institutional modifications, and results forecasts that are determined to achieve this goal (Lahera, 2004). In other words, public policies are a way to address social problems. The conceptualization and assessment of these social problems –also named problems of the public sphere – have varied throughout history. According to Parsons, proposing a public policy implies the recognition of a problem; in turn, the determination and definition of this problem depend on how politicians seek to approach an issue or event (Parsons, 1997).

When delving deeper into the definition of the problems that underlie public policies, it is essential to consider that these are configured based on perceptions. The reality is perceived through a paradigm, and this chosen paradigm, theory, or framework determines the problem

(Parsons, 1997). Consequently, social problems are complex, and their definition is not determinant.

A problem appears "when there is a difference between where you are now [...] and where you want to be [...]. In each case, 'where you want to be' is an imagined state that you would like to be in" (Robertson, 2011, p.1). Particularly, social problems or problems of public interest are configured as such taking into consideration desirable scenarios, which are transformed into objectives for the involvement off the community with its different actors and institutions.

Thus, it is possible to frame the origin of a public policy as the scheme indicated in the following figure:

Figure 1 Diagram about public policy origin (Parsons, 1997)

In this figure, public opinion, mass media, interest groups, political parties and international organizations play a role in the definition of public policies insofar as they raise social problems that need to be addressed, i.e., as long they propose the urgency of achieving desired social scenarios. In this respect, everyone may agree on an issue rather than on the definition of the problem and, therefore, on which public policies should be implemented (Parsons, 1997).

The complex nature of public policies is highlighted, understanding that these do not only refer to changes in the regulatory framework of a State but represent more complex structures that involve different institutions and actors, depending on the issue and problems involved therein.

For this work, the following model will be used to understand the process of implementing a public policy:

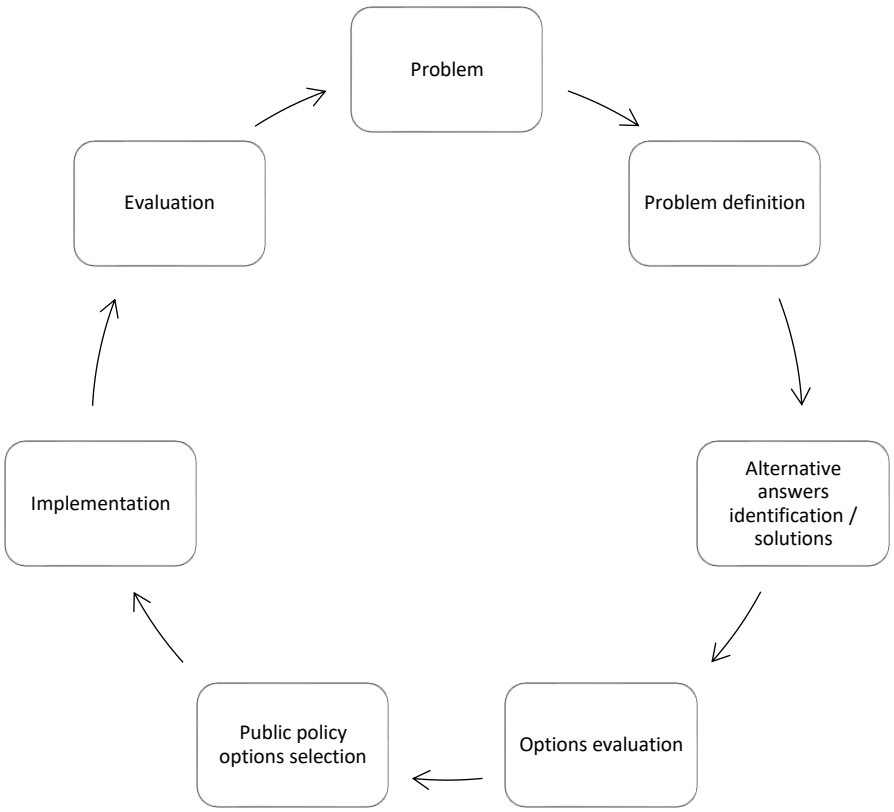

Figure 2 The life cycle of the public policies (Parsons, 1997)

Figure 2 shows the life cycle of public policies as presented by Parsons in 1997 (p. 111). This theoretical framework can be considered biased because it leaves out many of the complexities involved in public policy. However, this model, which represents the process divided into stages, is a tool that makes the analysis more manageable by establishing a common framework.

This research models the concept of public policies based on the schemes shown in Figures 1 and 2, with the understanding that reality is more complex than the frameworks mentioned above. It is worth mentioning that, according to Lahera, public policies necessarily represent some simplification of problems (2004, p. 10). The design, implementation, and evaluation of a public policy is a multidimensional and multidisciplinary process, which requires covering a wide range of facts and factors involving diverse realities and approaches. Accordingly, these stages or activities do not constitute logical sequences that necessarily culminate with the decision and implementation of a public policy (Parsons, 1997, p.17). However, they make it possible to determine a common theoretical framework for the analysis presented later in this paper.

Each conceptual framework consists of assumptions and categories that influence what intrigues the analyst, how he/she formulates his/her question, where he/she looks for evidence, and how he/she arrives at articulating an answer (Parsons, 1997). In this case, the conceptual

framework guiding the analysis, which will be presented in subsequent pages, is limited to comparing public policies in education through qualitative analysis of these policies and quantitative comparison of their indicators.

The conceptual framework of comparative public policy can be defined as a method for the study of public policy by adopting a comparative approach to the process of public policy, as well as to its outcomes and impact (Parsons, 1997).

Public policy analysis can provide information either for implementing new public policies or developing and transforming existing ones. This analytical process is carried out under an approach that guides the course of the analysis itself. The comparative approach, in other words, the comparative analysis of public policies, corresponds to comparing public policies within two or more comparable countries (Parsons, 1997).

The analysis of public policies can provide information for them, either in search of the implementation of new public policies or the development and transformation of existing ones. This analytical process is carried out under an approach that guides the course of the analysis itself. The comparative approach, i.e., the analysis of comparative public policies, entails comparing public policies within two or more comparable countries (Parsons, 1997).

2.3. The National Core Curriculum as Public Policy

Education is one of the recurring topics for public policies. This topic raises different social problems such as coverage, quality, the social role of schools, mandatory content and subjects, pedagogical and didactic trends, and the State's role in education, among others.

A field of research is dedicated to studying educational curricula, from their epistemological foundations to the content that should be considered therein. Scholars have attempted to define the curriculum by giving it different functions, implications, and depth depending on each era's political and pedagogical concerns (Iafrancesco, 1998).

"The word curriculum has its roots in the Latin word for track or racecourse" (Prideaux, 2003, p.1). In this sense, the curriculum is more than just determining the contents and subjects that students must take. The Real Academia de la Lengua Española [Real Academy of the Spanish Language] (n.d., definition 1 & 2) defines the word *currículo* [curriculum] as a plan of studies and set of studies and practices intended for the student to develop his or her potential fully. Likewise, the Oxford English Dictionary defines the word curriculum (n.d., definitions 1 & 2) as "A course" and "a regular course of study or training as at school or university."

The definitions provided by the dictionaries do not cover the depth of curricula as fundamental instruments within public policies in education. In this respect, academia attempts to define the curriculum from different perspectives, such as: the social function of education, pedagogical tasks, study plans, teaching-learning processes, school activities, teaching content, learning methods, human and material resources of the school, student training processes, institutional policies, among others (Iafrancesco, 1998).

For this thesis, the educational curriculum is defined as the legal document that determine schools' course of action. It establish the grades and subjects of compulsory education, determining the contents and methodology based on a particular political position, which establishes a specific disciplinary, pedagogical, and evaluative approach that is compulsory for the educational system of a territory Therefore, the curriculum is established to achieve particular political, social, cultural, and economic pretensions of a country through the schools and what is taught in them (Reid, 1990; Pinal & Bowers, 1992; Iafrancesco, 1998; Prideaux, 2003; Aristizábal *et al*., 2005; Baker, 2009). Therefore, the national core curriculum of a country is part of the public policies dealing with the country's National Educational objectives. It addresses the problem of establishing an educational system that helps achieve the national goals.

The educational curriculum has its material expression through a document of a legal nature, which regulates all matters related to the different educational levels.

2.4. Characterization of Chilean and Estonian national core curriculum

The national core curricula of Estonia and Chile differ in their design but have some similarities that allow for comparison. This section introduces a description and characterization of each of the curricular documents to establish specific points of comparison between them.

2.4.1. Estonia

The Estonian education system is divided into Preschool education, Basic education, and Secondary education, which can be General upper secondary school and Secondary vocational school. The national core curriculum is the central document guiding Estonian education, this document is divided into different documents for each educational level.

This thesis considers that basic education is a fundamental stage for digital literacy (see Section 2.2) because it is of utmost importance for children between 6 to 11 years old to begin

the development of digital competencies due to their imminent exposure to technological devices and digital environments. Accordingly, only the basic education curriculum (hereinafter *Estonian National Curriculum*) will be considered, because of its relevance in the initial development of digital competencies and its configuration has sufficient elements to compare it with the same Chilean educational level. These elements will be explained in section 3.2.

Estonian basic education corresponds to 9 grades, divided into 3 stages. The national curriculum for basic school has a central part and 13 appendices describing each of the 8 compulsory, 4 elective subjects, together with the syllabus for each one. Appendix 13 describes the objectives of the cross-curricular topics, along with the indications about how they are to be addressed during the different stages of basic education.

For this research, the complexity of the Estonian national curriculum will be limited to the general structure shown in Figure 3. This structure shows the curriculum's essential elements that allow understanding the purposes of the Estonian public policy in education and comparing it with other countries.

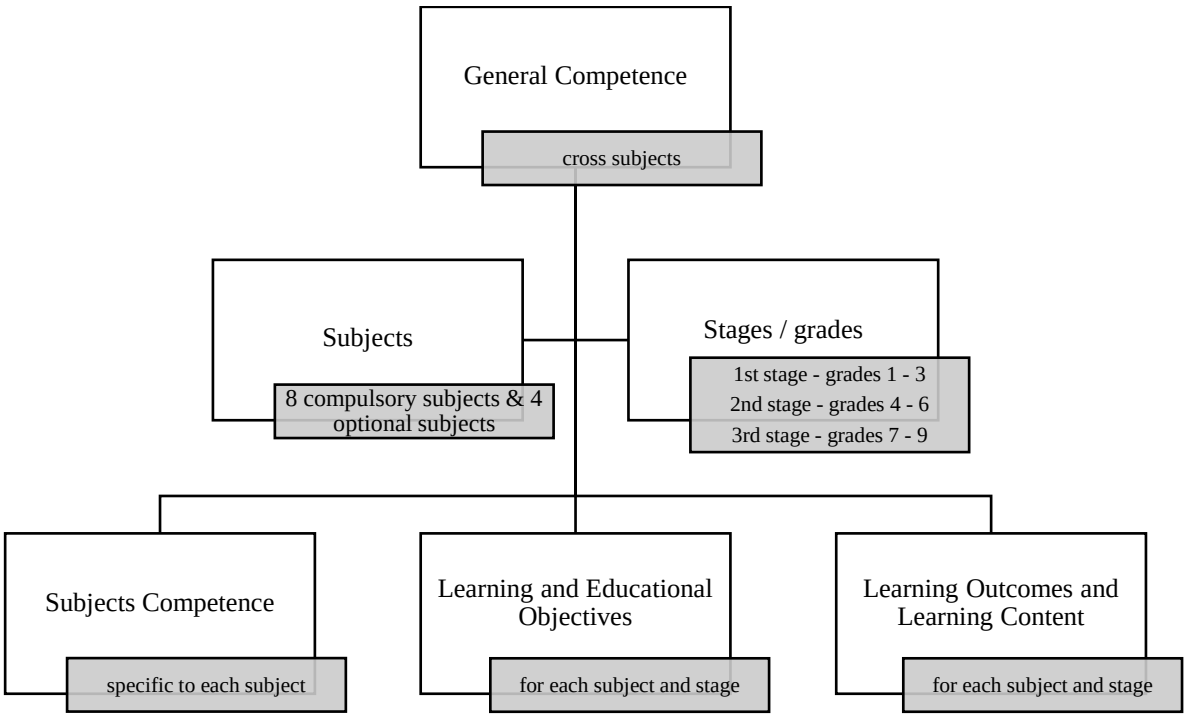

Figure 3 General structure of the Estonian national curriculum (Ministry of Education and Research, 2014)

The elements shown in Figure 3 are defined below:

- *General Competence*: It consists of "[…] cross subject field and subject competences that are important in the development of a person into a human and citizen. General competences are developed through all subjects as well as in extracurricular and out-of school activities. The development of general competences is monitored and directed by teachers in mutual cooperation as well as in cooperation between school and home" (Ministry of Education and Research, 2014, p. 3).
- *Subjects*: The Estonian education system comprises 8 compulsory subjects (*Language and Literature*, *Foreign Languages*, *Mathematics*, *Natural Science*, *Social Subjects* – divided in Social and Health Education (PSHE), History, Civics and Citizenship Education –, *Art Subjects* – divided into Music and Arts–, *Technology* – divided in Employment Studies, Handicraft and Home Economics and Technology studies –, and *Physical Education*) and 4 optional subjects (*Religion Studies*, *Informatic*, *Career Education* and *Entrepreneurial Studies*).
- *Stages*: There are three stages for which specific competencies, objectives, and outcomes are defined. The first stage covers 1st to 3rd grades, the second stage to 4th to 6th grades, and the third stage to 7th to 9th grades.
- *Subjects Competence*: it describes the competences to be developed by students in each subject. A "competence is the aggregate relevant knowledge, skills and attitudes that ensure the ability to operate creatively, in an enterprising way and flexibly in a particular area of activity or field" (Ministry of Education and Research, 2014, p. 3).
- *Learning and Educational Objectives*: It corresponds to the description of the learning objectives for each stage and subject.
- *Learning Outcomes*: "Learning outcomes that support the development of the learning and teaching outcomes and the development of subject field competences according to subskills or learning topics" (Ministry of Education and Research, 2014, p. 5).
- *Learning Content:* Description of contents that need to be addressed for the acquisition of the general competences and subject competences in each stage. These are described for each stage.

2.4.2. Chile

The Chilean education system is divided into three levels: preschool, basic education, and secondary education, which can be scientific-humanistic or technical-professional. A particular

curriculum regulates each of these levels. The main document for basic education is the *Bases curriculares: primero a sexto básico* (hereinafter Chilean national curriculum). It covers the knowledge, skills, and attitudes that students must learn to achieve the general objectives for 1st to 6th grade.

The following figure shows a general overview of the structure of the Chilean national curriculum for basic education:

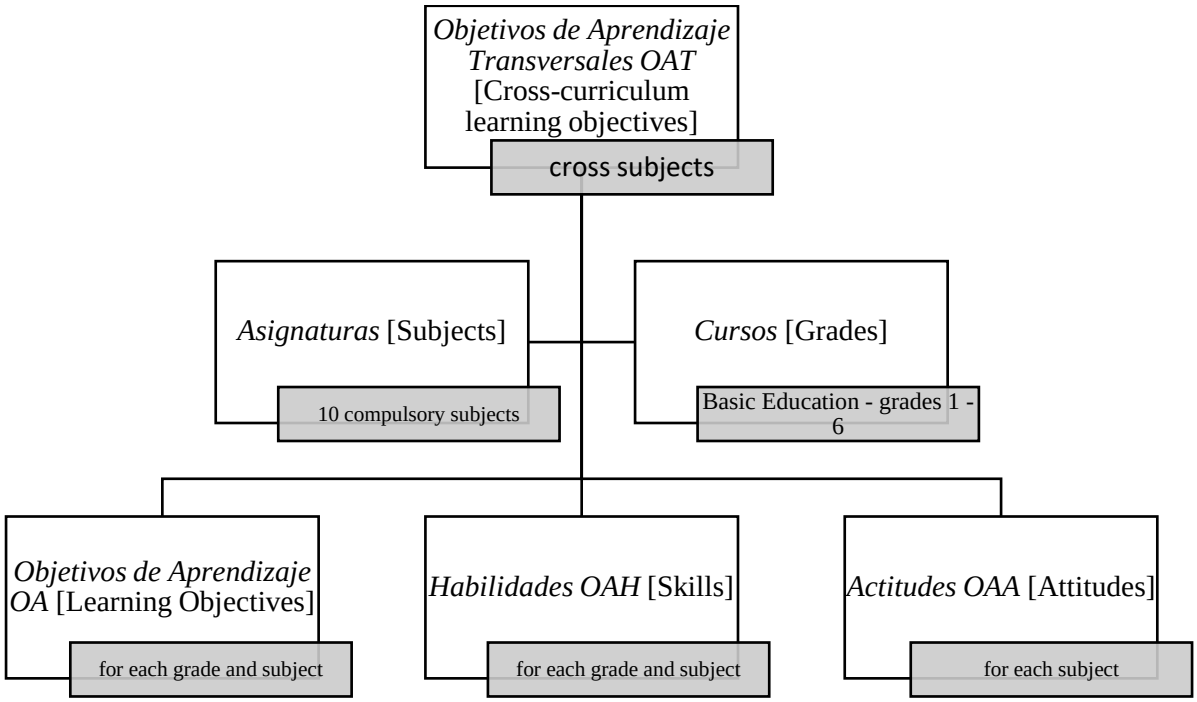

Figure 4 General structure of the Chilean national curriculum (MINEDUC, 2012)

The elements shown in Figure 4 are defined below:

- *Objetivos de Aprendizaje Transversales – OAT* [Cross-curriculum learning objectives]: Refer to the personal development and moral and social conduct of students. Therefore, they are transversal to all subjects. Their achievement depends on the totality of the elements that make up the school experience, both in and out of the classroom, without being specifically associated to a particular subject (MINEDUC, 2012).
- *Subjects*: The Chilean education system requires 10 compulsory subjects (*Artes Visuales*, *Ciencias Naturales*, *Educación Física y Salud*, *Historia, Geografía y Ciencias Sociales*, *Tecnología*, *Matemática*, *Idioma Extranjero Inglés*, *Lenguaje y Comunicación*, *Música* and *Orientación*).
- *Grades*: Chilean basic education has 6 grades, each of them with its own learning objectives.

- *Objetivos de Aprendizaje – OA* [Learning Objectives]: The OA define the expected learning for every subject for each school year. The learning objectives refer to skills, attitudes, and knowledge that favor students' integral development (MINEDUC, 2012).
- *Habilidades* [Skills]: Skills are abilities to perform tasks and solve problems with precision and adaptability. A skill can be developed in the intellectual, psychomotor, affective, and social domains (MINEDUC, 2012).
- *Actitudes* [Attitudes]: Attitudes are learned dispositions to respond favorably or unfavorably to objects, ideas, or people; they include affective, cognitive, and evaluative components that incline people to specific actions (MINEDUC, 2012).

2.5. Globalization of Public Policies in Education

Globalization and the interconnected reality of the 21st century have led States to set joint development objectives that contribute to creating a better world for all. These initiatives are led by international organizations at the regional and global levels. The following is a general description of the relevant initiatives for this analysis.

2.5.1. Regional level

The *United Nations* (UN), through the *Economic Commission for Latin America and the Caribbean* (ECLAC), has proposed the *Digital agenda for Latin America and the Caribbean* (eLAC 2024), which is "a strategy aimed at 2024, which promotes the use of digital technologies as instruments for sustainable development" (UN, 2023). The details of this agenda will be addressed in later sections.

The *European Union* (EU) also promotes initiatives related to education at the regional level. Some of these initiatives include:

The *Digital Competence of Educators* (DigCompEdu) (Punie & Redecker, 2017) for instance, which is "a scientifically sound background framework which helps to guide policy and can be directly adapted to implement regional and national tools and training programmes" (EU, 2023), specifically in the field of education. The Digital Competence Framework for Citizens 2.2 (DigComp 2.2) is another document that offers a definition of digital competence for Citizens that is shared by all Europe Union states.

2.5.2. Global level

The UN member states have proposed and worked on the *2030 Agenda for Sustainable Development*, which suggests 17 *Sustainable Development Goals* (SDP). Goal four is to achieve *Quality Education*, which contemplates "ensuring inclusive and equitable quality education and promote lifelong learning opportunities for all" (UN, 2023).

On the other hand, the *Organisation for Economic Co-operation and Development* (OECD) has developed the "*Programme for International Student Assessment*. PISA measures 15-year-olds' ability to use their reading, mathematics, and science knowledge and skills to meet real-life challenges" (OECD, 2023). This program and the results of its standardized assessments have become a benchmark for measuring and comparing the educational performance of OECD member countries, which include Chile and Estonia. PISA is relevant for this thesis because it collects data from questionnaires –applied simultaneously through the standardized exam– that gather information related to ICT in students, teachers, and schools. These data provide relevant information on DL. The analysis presented below will expand the review of the PISA data.

UNESCO, on its part, has developed *A Global Framework of Reference on Digital Literacy Skills for Indicator 4.4.2* (DLGF) that claims to provide "a methodology that can serve as the foundation for […] SDG thematic Indicator 4.4.2: 'Percentage of youth/adults who have achieved at least a minimum level of proficiency in digital literacy skills'" (2018).
Also, it has developed the *UNESCO ICT Competency Framework for Teachers, Version 3* (ICT CFT), which is "intended to be adapted to support national and institutional goals by providing an up-to-date framework for policy development and capacity building in this dynamic area" (2018).

2.6. Digital Literacy

Digital Literacy (hereinafter DL), as a concept, began to be widely used during the 1990s (Provenzo, 1992; Landow, 1992; Lanhan, 1995; Gritsenko & Dovgiallo, 1997; Gilster, 1997; Nicholas & Williams, 1998). The interest continues to this day due to the advent of Information and Communication Technologies (ICT) in most social practices of daily life. This made it necessary to question many issues related to these technologies, such as the limits and benefits, the use and capabilities required for its use, among others.

Just as the scope and development of new technologies have advanced dramatically, so has the conceptualization of DL. In 1995 Lanham defined it as "the ability to understand information however presented" (p. 198) based on the multimodal nature of digital information, saying that it consisted of "being skilled at deciphering complex images and sounds as well as the syntactical subtleties of words" (Lanham, 1995, p. 200).

Today, UNESCO (2021, p. 1) defines the concept of DL as:

> Digital literacy involves the confident and critical use of a full range of digital technologies for information, communication and basic problem-solving in all aspects of life. 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.

This definition implies much more than the ideas that emerged in the 1990s, as it is not only an extension of classical literacy to multimodal texts used by ICTs. The definition provided by UNESCO implies skills, competencies, contents and attitudes involved in DL, understanding that the use of technology is not only an individual practice but also a social one.

DL is both: it is a goal, and a tool to reduce the gaps which prevent citizens from joining the digital information society. In this regard, Lankshear and Knobel indicate that "[...]constructions of literacy in terms of skills, content, and competencies predicated on functioning within everyday economic, administrative, and social routines can be profoundly disabling for those deemed not to be literate" (2006, pp. 21-22). This is because literacy in classical terms – which in an ability to read and write – does not guarantee that individuals can fully access the globalized world.

In this sense, the imperative need for classical literacy has advanced to the need for DL because the mastery of traditional literacy is insufficient for the needs of this century, since it does not allow people to access the wealth of information linked to our society (George, 2020). In this scenario, it is assumed that people who are not trained to incorporate ICT in their work, educational, social and even personal world are being marginalized from society, decreasing their possibilities to develop at all social levels (Cabero, 2016, in Geoge, 2020). Thereby, DL becomes a fundamental right of citizens – as is and has historically been traditional literacy – for which the States must take responsibility through public policies that guarantee not only access to technologies, but also the opportunity to develop the skills, contents, and competencies necessary for their use and development.

2.7. Digital Literacy learning expectations

Several frameworks and recommendations for digital literacy have been outlined. Each framework has common themes in its expectations for student digital literacy. Some of these critical issues are:

First, students must understand their rights and responsibilities as digital citizens. They must be aware of online risks. Also, they must understand the ethical considerations of digital content creation, sharing, and intellectual property. The above is framed by developing critical thinking skills to evaluate digital information sources' credibility, accuracy, and relevance.

Second, students must communicate, collaborate and share information responsibly and ethically in digital environments. This includes effectively using email, social networking, online forums, and other digital communication tools.

Third, students must become proficient in the use of digital tools and technologies. This includes basic computer literacy, operating system navigation, use of computer applications, online research, and effective organization and presentation of information using digital resources.

Fourth, students must develop the ability to analyze and solve problems in digital contexts. They must learn to identify and address issues related to digital security, online ethics, digital divides, and information overload.

Finally, students must learn to maintain a healthy balance between their digital lives and other aspects of their well-being. This includes managing screen time, understanding the impact of digital technologies on physical and mental health, and promoting positive digital habits and digital wellness (Vuorikari, Kluzer & Punie, 2022; Punie & Redecker , 2017; Grizzle, Wilson & Gordon, 2021; UNESCO, 2018).

2.8. The Role of the National Core Curriculum in Promoting Digital Literacy

Educational curricula are fundamental for the expansion of DL, as they are part of public education policies, have wide coverage and scope, and are mandatory for all educational institutions in a country.

DL in education has been developed from two approaches. The first approach is based on increasing the coverage and access to technologies, proposing the need to incorporate hardware and software in educational institutions, in other words, the digitization of educational spaces.

A second approach is oriented to training citizens in digital skills that are supposed to be necessary for the world of work and insertion in today's digital and globalized society.

This thesis adopts UNESCO's definition of DL. Thus, it is understood that the role of the educational curriculum in fostering learners' digital literacy lies in the nature of the concept itself. DL may be conceptualized as the process of acquisition of the skills, attitudes and learning of content that can be better achieved through learners' engagement in DL-targeted pedagogical practices.

Furthermore, the systematization of DL through the educational curriculum, as a citizen's right, implies its democratization, since it is not only reserved for those who have access to it in their family circles or private institutions.

3. Method

This section describes the research methodology adopted in the current study, particularly, the research model, data collection and data analysis processes.

3.1 Research Model

This study adopts a comparative public policy model in order to analyze and evaluate public policies implemented in different contexts, thus comparing and contrasting specific characteristics and results of policies in selected countries. Accordingly, this research aims to explore public policies related to DL education, their treatment, results, and relevance.

First, this study defined the relevant variables to be analyzed in the national core curricula. These are the legal and institutional frameworks at the national and international levels concerning DL, the treatment given to DL in the national core curriculum, the objectives declared for the same topic, and the results obtained – by the educational systems – related to DL.

Second, data collection from relevant sources was conducted. This process is detailed in section 3.2.

Third, a comparative analysis of the data collected was conducted. The details of the analysis process are explained in section 3.3.

Finally, the conclusions obtained from the comparative analysis are discussed.

3.2 Data Collection Process

This research has been conducted using existing and relevant primary and secondary sources to compare the form, substance and outcomes of public education policies regarding students' digital literacy in Estonia and Chile. The quantitative and qualitative data were collected from both countries.

The main sources of information were governmental and international organizations' websites, databases and reports of the same organizations, Estonian and Chilean law documents, Chilean and Estonian National Core Curriculum and accompanying laws in each country. All these were obtained through the digital repositories of different international and governmental organizations, available for public use.

The main body of quantitative analysis is the report of the last PISA application in 2018, conducted by the OECD, the databases of the OECD, and Estonian and Chilean governmental organizations. From these documents were obtained quantitative data on the results of PISA, and other international and national assessments.

Regarding qualitative data, different reports, frameworks and recommendations related to digitization and digital literacy, elaborated by international organizations such as the OECD, the EU, ELAC, UNESCO, the UN and UNICEF, were used. In addition, Chile and Estonia's national core curriculum were analyzed through the relevance given to digitization and digital literacy.

The corpus from were obtained the data analyzed in this research is described below:

- National Core Curriculum of Estonia[1]: General provisions of national curriculum for basic school; Appendix 1 – Language and literature[2]; Appendix 3 – Mathematics; Appendix 4 – Natural Science; Appendix 5 – Social Studies; Appendix 7 – Technology; Appendix 10 – Informatics (Ministry of Education and Research, 2014):
- *Bases Curriculares: primero a sexto básico* [National Curriculum: 1st to 6th grade]: *Objetivos de Aprendizaje Transversales* [Cross-Curriculum Learning Objectives], pp. 28 – 31; *Ciencias Naturales* [Natural Science], pp. 69 – 106; *Historia, Geografía y Ciencias Sociales* [History, Geography and Social Science], pp. 137 – 179; *Tecnología*

[1] Only competences and syllabuses related to 1st and 2nd Stages (grades 1 – 3 & grades 4 -6) as the grades are comparable between Chile and Estonia.
[2] Only Estonian Language and Literature.

[Technology], pp. 181 – 211; *Matemática* [Mathematics], pp. 213 – 261; *Lenguaje y Comunicación* [Language and Communication], pp. 291 – 341.

- 21st -Century Readers: Developing Literacy Skills in a Digital World (2021), PISA, OECD.

The Chilean and the Estonian national core curriculum have different designs. Due to this reason, some points of comparison were selected according to the following standards:

1. The comparison was established for 1st to 6th grade of primary school. In Chile, this corresponds to basic education. In Estonia, it corresponds to 1st and 2nd stage of basic education.
2. Chilean national core curriculum shows target competencies and learning objectives for each subject and grade. In comparison, Estonia presents them for each subject and stage of studies, which are conformed by a group of grades. Due to this difference, learning outcomes were analyzed from 3rd grade and 6th grade since they represent the final grades of the 1st and 2nd stages of basic education in the Estonian educational system.
3. For the quantitative analysis, subjects directly related to digital competences and DL were selected. While in Estonia these subjects correspond to *Technology* and- the optional subject- *Informatics*, the reference in Chile is *Tecnología* [Technology].
4. The comparable subjects between both countries were selected for the quantitative analysis. In Estonia, the analysis focused on the competences and learning outcomes of the subjects of *Language and Literature, Mathematics, Natural Science, Social Studies, Technology*, and *Informatics*. In Chile, the subjects analyzed were *Ciencias Naturales* [Natural Science], *Lenguaje y Comunicación* [Language and Communication], *Historia, Geografía y Ciencias Sociales* [History, Geography and Social Science], *Tecnología* [Technology], and *Matemáticas* [Mathematics].

Due to the difference in design and concepts between the Chilean and Estonian national core curriculum the following comparison points were established:

Table 1 Comparison Point between Estonian and Chilean national curriculum.

Chile	Estonia
Objetivos de Aprendizaje Transversales – OAT [Cross-curriculum learning objectives]	*General Competences*
Habilidades [Skills]	*Subjects Competence*
Objetivos de Aprendizaje – OA [Learning Objectives]	*Learning and Educational Objectives*
	Learning Outcomes

3.3 Data Analysis

In the first stage, the data were organized according to the following dimensions:

- Learning Expectations: This criterion refers to what students are expected to learn concerning DL. Based on the data obtained from the national core curriculum, the differences between countries concerning DL, its treatment, and its relevance in the teaching and learning process of the countries are analyzed.
- Learning Outcomes: This criterion refers to the results obtained – related to DL – by the Chilean and Estonian education systems.

In the second stage, the data were analyzed, compared, and contrasted between Chile and Estonia, using criteria of comparative analysis of public policies and quantitative differences, to answer the research questions guiding this thesis. The following table summarizes the analysis criteria for each variable:

Table 2 Analysis Description

Dimension	Variable	Type	Definition	Specific Questions
Learning expectations	Subjects	Quantitative & Qualitative	Description, quantification, and analysis of the subjects related to technology and DL considered in the national core curriculum.	How many subjects directly related to technology and DL are considered in the national core curriculum of each country?
				How are these subjects related to technology and DL?

				What are their general objectives?
	Cross-curriculum objectives related to ICT and DL	Quantitative & Qualitative	This variable describes, quantifies, and analyses the transversal objectives (cross-curriculum objectives) concerning DL declared by the national core curriculum.	What and how are the cross-curriculum objectives related to ICT and DL? What are these objectives aimed at?
	Specific objectives related to ICT and DL	Quantitative & Qualitative	This variable is a description, quantification, and analysis of the specific objectives related to DL of the different subjects of the national core curriculum.	What and how are the specific objectives related to ICT and DL? What are these objectives aimed at?
Learning outcomes	Results	Qualitative	This variable describes the results obtained by the educational systems related to digital literacy.	What are the results of the educational systems concerning DL? What are their differences?

4 Results

This section shows the results from analyzing the corpus selected for this research. These results provide an answer to the following research questions: What is Digital Literacy's role in Estonia and Chile's national curriculum? How is that role associated with the Digital Literacy level of learners in Estonia and Chile? To what extent can the National Core Curriculum play a positive role in fostering learners' Digital Literacy?

4.1 Learning Expectations

This section reports the results of the data analysis related to learning expectations obtained from the national curricula of Chile and Estonia.

4.1.1 Subjects

The Estonian national curriculum for basic education includes 12 subjects, of which 8 are compulsory, and 4 are optional. The description of each of these subjects can be found in Appendix 1.1.

On the other hand, Chile's national curriculum for basic education also includes 12 subjects, but all of them are compulsory.

The following table shows the subjects directly related to technology and DL in each country:

Table 3 Subjects directly related to technology and DL

Chile	**Estonia**
Tecnología [Technology]	Technology
	Informatics

Table 4 shows Estonia's national curriculum considers 2 subjects directly related to technology and DL, while Chile's considers only 1 subject. However, these subjects are very different from each other.

In the Estonian national curriculum, the main objective of the subject of technology – compulsory for basic education– is the development of *technological competence*. This is directly related to DL since it involves understanding technology as an integral concept containing ICT. Thus, the development of age-appropriate *technological literacy* is considered one of the elements of DL. On the other hand, Informatics is an optional subject from the 2nd stage of basic education. This subject is fully related to DL, as its competencies, learning objectives, and learning outcomes aim to develop digital competence by the students, framing the teaching in an environment conducive to acquiring the necessary competencies for the school and the students' future development.

In Chile, the subject of *Tecnología* [Technology] helps students with understanding the relationship between humans and the artificial world through observation, reflection, and creation. Regarding ICT, students are expected to be able to use basic software functions such as word processing, spreadsheet, presentation program, drawing software, and internet, developing ICT skills to solve learning tasks in all subjects and situations of their daily lives.

Notably, the difference between the Estonian and Chilean subjects related to technology and DL lies in developing digital competencies. Estonia has the development of such

competencies as a central axis, while Chile gives more relevance to the basic and guided use of tools, evidencing a utilitarian vision of technology.

4.1.2 Cross-curriculum objectives related to ICT and DL[3]

The national core curriculum of Chile declares cross-curriculum learning objectives that establish comprehensive and general goals for school education, referring to students' personal, intellectual, moral, and social development. In the dimension *Tecnologías de información y comunicación (TIC)* [Information and communication technology (ICT)], the document presents the general purpose of providing students with tools that enable them to manage the digital world and develop in it by using the digital devices and technology competently and responsibly. Specifically, five objectives are given: the first is competence in the use of digital information sources; the second is to use ICT to solve information, communication, expression, and creation needs; the third is competence in the use of ICT as a way to represent, analyze and model the world and problem-solving effectively and efficiently; the fourth is the use of social and communication networks for social and civic participation; and last one is competence in the conscient and responsible use of ICT, through self-care, respect for others, the right to privacy and intellectual property.

The Estonian national core curriculum establishes general competencies for basic education, two related to ICT and DL. The first one is mathematics, natural science, and technology competence, which talks about students purposefully using technology, and understanding its limits and importance. The second one speaks directly to DL, establishing digital technology as a complex reality that requires adaptability, responsibility, perseverance, and judgment. Furthermore, this competency involves the creation, communication, problem-solving, and critical moral and values judgment of digital technologies and their use, i.e., it establishes a comprehensive view of digital literacy that involves the knowledge, skills, and attitudes that are required to ensure the optimal development of students in the digital world.

[3] View Appendix 1.2

4.1.3 Specific objectives related to ICT and DL[4]

When analyzing the Chilean national curriculum for basic education, the following number of Skills and Learning Objectives related to ICT and DL were detected:

Table 4 Skills and learning objectives related to DL in Chilean national curriculum.

Chile	Grade	Number
Habilidades [Skills]	3rd	2
	6th	2
Objetivos de Aprendizaje – OA [Learning Objectives]	3rd	11
	6th	17
Total Amount		32

While the analysis of the Estonian national curriculum delivered the following number of Subjects Competence, Learning and Educational Objectives, and Learning Outcomes:

Table 5 Subjects competencies, learning objectives and learning outcomes in Estonian national curriculum.

Estonia	Grade	Number
Subjects Competence	All basic education	12
Learning and Educational Objectives	All basic education	11
	3rd (1st stage)	1
	6th (2nd stage)	6
Learning Outcomes	3rd (1st stage)	3
	6th (2nd stage)	27
Total Amount		60

As Tables 5 and 6 show, the Estonian curriculum almost doubles the objectives related to ICT and DL shown in the Chilean curriculum. Nevertheless, this information did not reflect the nature of these specific objectives. The results of the content review of each of the objectives, competencies, and skills of both curricula (Appendix 1.3) is described below.

The skills and learning objectives found in the Chilean curriculum refer only to the use of ICT as valuable tools for specific tasks. This curriculum does not propose learning objectives for each subject that were tending to the development of digital competencies and DL. On the other hand, the Estonian curriculum shows a complete development that tends towards

[4] View Appendix 1.3

developing digital competencies and DL. It proposes a curriculum integrating digital competencies with developing other necessary competencies, such as communicative and mathematical competence.

4.2 Learning outcomes

There are no international standardized assessment measures targeting students' digital competencies. However, research has indicated a significant correlation between digital literacy and reading performance. Students who have greater exposure to digital skill development within the school environment tend to demonstrate better reading abilities (OECD, 2021). The latest results from the PISA assessment support this notion, highlighting the importance of providing digital skill learning opportunities at school to narrow the socioeconomic gap between countries. Therefore, it can be inferred that a student's level of digital literacy is intertwined with the development of other essential skills, such as critically evaluating the credibility of different sources of information (OECD, 2021).

In the context of Estonia and Chile, the disparity in reading performance is significant. Estonia achieved a score of 523 points on the reading test, while Chile obtained 452 points[5] (OECD, 2021). This gap is further supported by the self-reported data from students regarding their access to opportunities for acquiring digital skills. Estonian students reported higher percentages of positive responses to questions related to learning opportunities in the digital skills domain[6] (OECD, 2021).

5 Discussion

Public education policies are crucial to address the need for digital skills and to ensure that future generations are equipped to thrive in an increasingly digital world. In this context, States could progress to recognize digital literacy as a fundamental citizen's right like it happened with traditional literacy in the past, thus undertaking to take proactive measures to guarantee the development of these skills. This implies a forward-thinking vision that anticipates rapid technological advancements and provides long-term solutions for nurturing digital skills in the younger generations.

[5] View Appendix 2.2
[6] View Appendix 2.1

Following Parson's life cycle of public policy, the first step involves identifying the problem and searching for practical solutions. In the case of digital literacy, this research serves as an essential initial step in raising awareness and problematizing the issue for the Chilean State. The disparity in public education policies regarding digital literacy becomes clear by highlighting the comparison between the national curriculum for basic education in Estonia and Chile.

Estonia has taken a proactive approach to address digital literacy by designing an education system that prioritizes the acquisition of digital competencies throughout the entire educational process. Their national curriculum reflects a coherent and comprehensive public policy system that aligns with the demands of digital innovation. Estonia's success in integrating digital literacy into its education system is an inspiring example for other nations seeking to adapt to the increasingly digital world and to embark on a similar path toward digital innovation.

Furthermore, the global recognition of digital literacy as a crucial educational goal is evidenced by the frameworks developed by various international organizations. These frameworks emphasize the importance of fostering digital competencies in education, further emphasizing the need for public education policies to prioritize and address the development of these skills.

In conclusion, public education policies must consider the urgent need for digital skills and adopt a proactive approach to ensure that future generations are prepared for the digital world. By learning from the examples set by Estonia and the global emphasis on digital competencies, States can design comprehensive public policy systems that prioritize digital literacy as a fundamental aspect of education, empowering students to navigate and thrive in the ever-evolving digital landscape.

6 Conclusion and recommendations

This section provides the general conclusions obtained from this research. In addition, recommendations are provided for the Chilean State to improve its national curriculum for basic education concerning to DL. From this, considerations for future research and the limitations of this research are described.

6.1 Conclusion

Fist, in Estonia, digital literacy is recognized as a cross-curricular objective and is considered essential for students' overall school development and future employability. It is integrated throughout the national curriculum for basic education, serving as a fundamental axis for the educational process. On the other hand, in Chile, digital literacy plays a secondary role in the national curriculum. It primarily focuses on using practical tools for specific tasks rather than considering it as a foundational aspect of education.

Second, the role of digital literacy in the national curriculum is associated with the level of digital competencies among learners in Estonia and Chile. Estonia's deliberate focus on cultivating digital skills within its education system implies that its learners are likely to have a higher level of digital literacy. This inference is supported by Estonia's better performance in the PISA reading test, which may be correlated with its students' higher level of digital literacy. In contrast, the secondary role given to digital literacy in Chile's curriculum suggests that learners may have a lower level of digital competencies.

Third, the National Core Curriculum can play a positive role in fostering learners' digital literacy to the extent that it recognizes digital literacy as a cross-curricular objective and integrates it throughout the curriculum. By prioritizing digital literacy and considering it as a fundamental aspect of education, the National Core Curriculum can provide a framework for educators to design learning experiences that develop learners' digital competencies. It can guide the incorporation of digital tools, skills, and critical thinking into various subjects and learning contexts. However, for the National Core Curriculum to effectively foster learners' digital literacy, it requires a comprehensive and coherent approach that permeates all levels of education and is supported by appropriate resources, teacher training, and ongoing evaluation.

6.2 Recommendations for Chilean State

Considerations for improving the Chilean national core curriculum to enhance digital literacy:

- Review and prioritize DL: Thoroughly review the national curriculum for basic education to prioritize digital literacy as a fundamental component. Involve experts in digital education and consider successful models like the Estonian national curriculum.
- Regular evaluations and assessments: Conduct regular evaluations and assessments of the curriculum to ensure its relevance and alignment with the changing needs of a digital society. This will help to identify areas for improvement and keep the curriculum up to date.

- Flexibility and adaptability: Design the curriculum with flexibility and adaptability in mind to integrate emerging technologies and future advancements. This will enable students to develop relevant digital skills.
- Integration across subjects: Integrate digital competencies across all subjects in the curriculum. Align cross-curriculum objectives (*Objetivos Transversales*) with specific learning objectives (*Objetivos de Aprendizaje*) to ensure consistent development of DL throughout the basic education.
- Accessible digital infrastructure: Ensure equitable access to digital education by providing necessary infrastructure, such as reliable internet connectivity, computers, and digital devices, in schools across the country. Make digital resources, educational software, digital libraries, and online learning platforms accessible to all students and teachers.
- Collaboration and partnerships: Foster collaboration between educational institutions, policymakers, and industry experts. Engage with technology companies, organizations, and experts in the field to gather insights, expertise, and support in designing and implementing an effective digital literacy curriculum.

By considering these points, the Chilean State may strengthen its national core curriculum, empower students with DL, and prepare them to thrive in the digital age.

6.3 Considerations for future research

This research proposes to deepen the investigation on the impact of the role of digital literacy in public education policies and the results obtained by students, both in digital competencies and in other related competencies. Explaining more precisely the relationship between students' digital literacy level and their school performance in critical subjects such as mathematics and language.

In the same way, it is proposed to investigate the teaching and learning processes developed within the current curriculum to know the impact of these dynamics on students' digital literacy levels. This involves knowing and analyzing the teaching practices that are carried out and that impact the students' digital literacy level. It also involves knowing the level of digital literacy of teachers in order to consider how they can contribute to the digital development of students.

Finally, it suggests the possibility of researching and implementing teaching methodologies and techniques that facilitate the development of digital competencies according to the context of the students.

6.4 Limitations

There are topics that exceed the scope and purposes of this study and, consequently, were not covered. This research focused on public policies in education expressed through the curricula of basic education, where the major actor is the State, and the receptors are the students.

Therefore, this thesis does not address the reasons for the differences between the two countries, which means no political, economic, or social analysis was made regarding the quantitative and qualitative differences in facts such as spending on education or the digitalization of education systems.

On the other hand, this analysis does not involve other actors in the educational system, such as teachers; in other words, it does not study teachers' digital literacy, their training, or the teaching methodologies and didactics that teachers practice in the classrooms of both countries.

Finally, it was not empirically proven that the recommendations made are effective in the short or long term, as this requires that they are effectively converted into public policies, which is beyond the scope of this thesis.

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Author's declaration

I hereby declare that I have written this thesis independently and that all contributions of other authors and supporters have been referenced. The thesis has been written in accordance with the requirements for graduation theses of the Institute of Education of the University of Tartu and is in compliance with good academic practices.

María Fernanda Montes Padilla

2nd June 2023

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Appendices

1. Learning Expectations

Appendix 1.1: Data about Subjects

Country: Estonia

Total subjects: 12 (8 compulsory and 4 optional)

Table 6 Subject desciptions in Estonian national curriculum (Ministry of Education and Reseach, 2014)

Subject	Type	Sub-subjects	Description according to national curriculum
Language and literature	Compulsory	1. Estonian language and literature 2. Russian language and literature	"The objective of teaching language and literature subjects in basic school is to develop in students age-appropriate language and literature competence, which means an ability to understand age-appropriate texts of fiction and comprehend the importance of such texts in Estonian and global cultural history, as well as to perceive language and literature as the basis of national and personal identity; a linguistic awareness and ability of oral and written expression in accordance with respective communication situations and goals of language use; realization that reading provides an opportunity for intellectual enrichment" (Appendix 1, p. 1)
Foreign languages	Compulsory	1. Foreign language A 2. Foreign language B 3. Estonian as a second language	Foreign language A and B (English, French, German or Russian) as well Estonian as a second language (in schools where language instructions is not Estonian) pretend to "develop students' age-appropriate foreign language competence, i.e., the ability to understand and interpret the content presented in a foreign language" (Appendix 2, p. 1)
Mathematics	Compulsory	N/A	"The aim of mathematics education is to develop in basic school students mathematics competence, which is adequate for their age; it means the ability to use the language, symbols and methods characteristic of mathematical applications to solve various problems in mathematics as well as in other school subjects and walks of life, to understand social, cultural and personal meaning of mathematics; the skill to formulate problems, identify and implement

			suitable solution strategies, analyze solution ideas and test the accuracy of results; the skill of logical reasoning, justification and proof by using and understanding different presentation methods" (Appendix 3, p. 1).
Natural science	Compulsory	1. Science 2. Biology 3. Geography 4. Physics 5. Chemistry	"The gaining of competencies in natural science refers to the capability to: observe and explain phenomena and processes that exist in the natural, technological and social environment (hereafter referred to as 'the environment'); analyse the environment as a system; identify science-related problems occurring in the environment and use natural science methods to solve them; make decisions on socio-scientific issues. Gaining competencies in natural science also refers to developing an interest in natural science and cultural phenomena as the basis of developing a world view and to value the natural diversity and the need to appreciate a responsible and sustainable lifestyle" (Appendix 4, p. 1).
Social subjects	Compulsory	1. Personal, social and health education (PSHE) 2. History 3. Civic and citizenship	"The objective of teaching the subjects of the subject field in basic school is to develop in students age appropriate social competence: ability to understand the causes and effects of changes in society; knowledge of and respect for human rights and democracy; knowledge ge of civil rights and responsibilities and ability to behave accordingly; ability to recognize cultural diversity; ability to follow generally accepted rules of conduct; interest in the development of one's community, nation, state and the world; ability to form personal opinions and be an active and responsible citizen; knowledge of and ability to use simple research methods in social studies; interest in the surrounding world" (Appendix 5, p. 1).
Art subjects	Compulsory	1. Music 2. Art	"The objective of teaching subjects of the art field in basic school is to develop in students age-appropriate art competence: ability to understand the diversity of arts, to reflect on issues of art and music; to value the artistic heritage of the local region, Estonia and the world; to see the relationship between the culture of different eras and modern culture; to use means of artistic and musical expression in personal and collective creative efforts, to appreciate their own artistic creations and those of their peers" (Appendix 6, p. 1).
Technology	Compulsory	1. Employment studies	"The objective of teaching subjects of the technology field in basic school is to develop

		2. Handicraft and home economics 3. Technology studies	students' age-appropriate technology competence: ability to navigate the world of technology, understand technological development trends and connections with scientific achievements; to acquire technological literacy for age-appropriate, creative and innovative use of technology, integrating mental work with manual activities; to analyze the opportunities and threats of applying technology; to comply with intellectual property protection requirements; to solve problems, integrating mental work with manual activities, and to purposefully put ideas into practice; to cope with housework and to eat healthy" (Appendix 7, p. 1)
Physical education	Compulsory	N/A	"The objective of physical education in basic school is to develop students' age-appropriate physical education competence: ability to recognize the value of physical activity and healthy living as a part of one's lifestyle; ability to assess one's physical fitness level and readiness to practice suitable sports or exercise; ability to show tolerance towards peers, follow the rules of fair play and value cooperation during sports and exercise" (Appendix 8, p. 1).
Religion studies	Optional	N/A	The subject of religious studies is based on the recognition of the principle of freedom of religion and thought as stipulated in the United Nation's Universal Declaration of Human Rights. […] These religious studies do not advertise any particular church, congregation or other religious association. (Appendix 9, pp. 1 - 2)
Informatics	Optional	N/A	"The general goal of teaching informatics is to ensure that basic school graduates are able to use the ICT to shape their current working and learning environments" (Appendix 10, p.1). Based on the principles of relevance, active learning, creativity, innovation, and collaborative learning, it is intended that students develop the necessary digital competencies required for school development and future performance in the working world.
Career education	Optional	N/A	"The subject 'Career Education' covers topics developing students' readiness to gain better employment on the labor market, increasing their independent decision-making, helping to fulfil different roles during their life and achieving lifelong learning" (Appendix 11, p.1).
Entrepreneurial studies	Optional	N/A	"The study load of entrepreneurship studies is 35 hours, and it is recommended to teach the subject

			in the 8th or 9th grade. The subject is addressed in conjunction with daily life. The subject can be taught as a practical activity through participation in the operation of the mini company" (Appendix 12, p. 1)

Country: Chile

Total subjects: 12

Table 7 Subjects description in Chilean national curriculum (MINEDUC, 2012)

Subject	Type	Description according to national curriculum
Lenguaje y Comunicación	Compulsory	The subject of Language and Communication [Lenguaje y comunicación] is organized in the axes of reading, writing, and oral communication, which aim to develop communicative competencies of listening, speaking, reading, and writing. ICT is integrated into the development of the subject. The Internet provides the possibility of accessing all kinds of texts and constitutes one of the indispensable tools for searching for information and learning to do research. On the other hand, writing e-mails, blogs, and digital presentations offers opportunities to exercise writing in real communication contexts that are attractive to children and typical of today's world. Likewise, word processors have proven to be very useful for writing tasks. Finally, using programs for oral presentations contributes to learning how to structure the presentation and have visual support.
Idioma Extranjero Inglés	Compulsory in 5th and 6th grade.	The subject of English as a foreign language is based on the relevance of acquiring this language in the globalized world. It is taught through a communicative approach to language teaching. Technological media and the countless resources available on the web are excellent support for learning and teaching a foreign language. The incorporation of ICTs in the English class encompasses a wide range of possibilities, from audio and video CDs to using the computer and the Internet to support and complement students' learning and develop productive and receptive skills
Matemática	Compulsory	The formative purpose of mathematics [Matemáticas] is to enrich the understanding of reality, facilitate the selection of strategies to solve problems and contribute to developing critical and autonomous thinking in all students. Mathematics seeks to develop essential cognitive skills, such as visualization, representation, modeling and problem-

		solving, simulation and conjecture, and recognition of structures and processes. In basic education, technological tools (calculators and computers) contribute to the learning environment by allowing students to explore and create patterns, examine relationships in geometric configurations and simple equations, test answers, test conjectures, organize and display data, and shorten the duration of laborious calculations needed to solve certain types of problems.
Ciencias Naturales	Compulsory	Natural Science [Ciencias Naturales] learning objectives promote the understanding of the big ideas of science and the progressive acquisition of scientific thinking skills and methods. This course is intended to make students scientifically literate. At this level, specific skills in the use of ICT are also relevant, as they contribute to the development of various skills specific to the subject. For example, in the first instance, the use of ICT is promoted as a means of recording information and transmitting scientific ideas and evidence. Once students internalize this function, they are expected to integrate ICTs extensively in the development of various projects and activities at all stages of scientific learning. In this way, they will have the possibility of internalizing the ways of learning and thinking associated with these tools.
Historia, Geografía y Ciencias Sociales	Compulsory	The subject of history, geography, and social sciences [Historia, geografía y ciencias sociales] aims to develop students' awareness of their natural and social environment, distinguishing the different elements and actors - people and institutions - that make up the world around them and recognizing their own identity and role in it. Also, the formation of historical thinking, starting with family history, environment, and Chilean society, and then expanding to the understanding of the history of the world. On the other hand, it is intended for the valuation and application of methodologies of the social sciences, the panoramic vision of the history of Chile, the formation of geographical thinking, the development of citizenship skills, and respect and appreciation of human diversity.
Artes Visuales	Compulsory	[Arts] This subject enables students to develop sensitivity, reflective and critical thinking skills that will allow them to get the most out of the artistic experience. In addition, they learn to express themselves and to create using the elements of the language of the visual arts and to value the manifestations of the language of the visual arts and to value the artistic manifestations of the visual arts,

		appreciating artistic manifestations, recognizing them as part of their legacy and personal identity. ICT plays a central role since it can contribute to the teacher and students in terms of expression, creativity, dissemination, presentation, and criticism.
Música	Compulsory	The music [Música] subject aims to develop students' taste, expression, and enjoyment of music. No relationship with ICT is described.
Educación Física y Salud	Compulsory	Physical Education and Health [Educación Física y Salud] is a subject that promotes the regular practice of physical activity, where students will be able to develop motor skills, attitudes prone to fair play, leadership and self-care. This will give them the possibility of acquiring an active and healthy lifestyle, associated with multiple individual and social benefits.
Tecnología	Compulsory	The Technology [Tecnología] subjects seek students to understand the relationship between humans and the artificial world through observation, reflection, and creation. Regarding ICT, students are expected to be able to use basic software functions such as word processing, spreadsheet, presentation program, drawing software, and internet, developing ICT skills to solve learning tasks in all subjects and situations of their daily lives.
Orientación	Compulsory	The purpose of the Orientation [Orientación] subject is to contribute to the integral formation process of the students. Considering that the person is a unique, transcendent, perfectible individual who develops with others. This subject seeks to promote personal, affective, and social development. No relationship with ICT is described.
Religión	Compulsory	Decree No. 924, enacted in 1983 by the Ministry of Education of Chile, Regulation on the Lessons about Religion in educational centers. This document has not been analyzed in this thesis.

Appendix 1.2: Data about Cross-curriculum objectives related to ICT and DL

Table 8 Cross-curriculum objectives related to ICT and DL (Ministry of Education and Research, 2014 & MINEDUC, 2012)

Country	Document	Type	Page	No.	Evidence
Estonia	National Curriculum for Basis School_- General Part	4. Competences	4	6	mathematics, natural sciences and technology competence – the ability to use the language, symbols and methods characteristic of mathematical applications in school and everyday life; the ability to describe the surrounding world with the help of natural science models and measurement tools and to make decisions based on evidence; to understand the importance and limitations of natural sciences and technology; to use new technologies purposefully
				8	digital competence – the ability to use developing digital technology for coping in a quickly changing society for learning, acting as a citizen as well as communicating in communities; to use digital means for finding and preserving information and to evaluate the relevance and trustworthiness of the information; to participate in creating digital content; including creation and use of texts, images, multimedia; to use suitable digital tools and methods for solving problems, to communicate and cooperate in different digital environments; to be aware of the dangers of the digital environment and know how to protect one's privacy, personal
Chile	Bases Curriculares de Educación Básica	Objetivos de Aprendizaje Transversales	31	28	Tecnologías de información y comunicación (TIC): El propósito general del trabajo educativo en esta dimensión es proveer a todos los alumnos y las alumnas de las herramientas que les permitirán manejar el "mundo digital" y desarrollarse en él, utilizando de manera competente y responsable estas tecnologías. Los Objetivos de Aprendizaje en esta dimensión son: 28. buscar, acceder y evaluar la calidad y la pertinencia de la información de diversas fuentes virtuales.

				29	29. utilizar TIC que resuelvan las necesidades de información, comunicación, expresión y creación dentro del entorno educativo y social inmediato.
				30	30. utilizar aplicaciones para presentar, representar, analizar y modelar información y situaciones, comunicar ideas y argumentos, comprender y resolver problemas de manera eficiente y efectiva, aprovechando múltiples medios (texto, imagen, audio y video).
				31	31. participar en redes virtuales de comunicación y en redes ciudadanas de participación e información, con aportes creativos y pertinentes.
				32	32. hacer un uso consciente y responsable de las tecnologías de la información y la comunicación, aplicando criterios de autocuidado y cuidado de los otros en la comunicación virtual, y respetando el derecho a la privacidad y la propiedad intelectual

Appendix 1.3: Data about Specific objectives related to ICT and DL

Language and Literature and Lenguaje y comunicación

Country: Estonia

Document: Appendix 1: Language and Literature

Table 9 Objectives related to ICT and DL - Estonian subject language and literature (Ministry of Education and Research, 2014)

Page	Subject/sub-subject	Grade / stage	Thematic area	Topic / No.	Evidence	Type
1	Language and Literature	all basic education	1.1. Language and literature competence	1.1-6	use different communication channels appropriately and are able to find, critically judge and use information provided by the media and online;	Subject Competence
1	Language and Literature	all basic education	1.1. Language and literature competence	1.1 -11	know how to learn and seek information in different sources and use dictionaries and handbooks.	Subject Competence
8	2.1. Estonian language	all basic education	2.1.1. Learning and educational objectives	2.1.1 - 3	learn to use different communication channels appropriately and develop their ability to find, critically judge and purposefully use information provided by the media and online;	Learning and Educational Objectives
8	2.1. Estonian language	all basic education	2.1.1. Learning and educational objectives	2.1.1 - 7	consult dictionaries, reference books and online sources to improve their literary standard proficiency;	Learning and Educational Objectives
13	2.1 Estonian language	1st stage	2.1.4. Estonian Language Learning and Educational Outcomes in the 1st	2.1.4 - Writing 11	compile invitations, congratulations, messages and e-mails and write paraphrases and other pieces of creative writing with the help of questions, support words, drawings, pictures, picture series, keyword	Learning Outcomes

			Stage of Study		schemes or outlines of length appropriate to their age; and	
14	2.1 Estonian language	2nd stage - by 6th grade	2.1.5. Estonian Language Learning and Educational Objectives in the 2nd Stage of Study	2.1.5 -7	are able to use ÕS (Dictionary of Orthology) and interactive orthography sources.	Learning and Educational Objectives
16	2.1 Estonian language	2nd stage	2.1.6. Estonian Language Learning and Educational Outcomes in the 2nd Stage of Study	2.1.6 - Orthology and language planning 3	can use online and printed dictionaries for checking the meaning and orthography of words;	Learning Outcomes
24	2.2 Literature	2nd stage - by 6th grade	2.2.3. Literary Studies Learning and Educational Objectives in the 2nd Stage of Study (Forms 5 and 6)	2.2.3 - 6	can use different sources, including dictionaries and the Internet, to find necessary information.	Learning and Educational Objectives

Country: Chile

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Table 10 Objectives related to ICT and DL - Chilean subject Lenguaje y Comunicación (MINEDUC, 2012)

Page	Subject/sub-subject	Grade / stage	Thematic area	Topic / No.	Evidence	Type
319	Lenguaje y Comunicación	3rd	Lectura	9	Buscar información sobre un tema en libros, internet, diarios, revistas, enciclopedias, atlas, etc., para llevar a cabo una investigación.	Objetivo de Aprendizaje
321 - 322	Lenguaje y Comunicación	3rd	Comunicación Oral	28	Expresarse de manera coherente y articulada sobre temas de su interés: - organizando las ideas en introducción y Desarrollo - incorporando descripciones y ejemplos que ilustren las ideas - utilizando un vocabulario variado - reemplazando los pronombres por construcciones sintácticas que expliciten o describan al referente ú usando gestos y posturas acordes a la situación - usando material de apoyo (power point, papelógrafo, objetos, etc.) si es pertinente	Objetivo de Aprendizaje
338	Lenguaje y Comunicación	6th	Lectura	11	Buscar y comparar información sobre un tema, utilizando fuentes como internet, enciclopedias, libros, prensa, etc., para llevar a cabo una investigación.	Objetivo de Aprendizaje
338	Lenguaje y Comunicación	6th	Lectura	12	Aplicar estrategias para determinar el significado de palabras nuevas:	Objetivo de

					- claves contextuales - raíces y afijos - preguntar a otro - diccionarios, enciclopedias e internet	Aprendizaje
338	Lenguaje y Comunicación	6th	Escritura	13	Escribir frecuentemente, para desarrollar la creatividad y expresar sus ideas, textos como poemas, diarios de vida, cuentos, anécdotas, cartas, blogs, etc.	Objetivo de Aprendizaje
339	Lenguaje y Comunicación	6th	Escritura	18	Escribir, revisar y editar sus textos para satisfacer un propósito y transmitir sus ideas con claridad. Durante este proceso: - agregan ejemplos, datos y justificaciones para profundizar las ideas - emplean un vocabulario preciso y variado, y un registro adecuado - releen a medida que escriben - aseguran la coherencia y agregan conectores - editan, en forma independiente, aspectos de ortografía y presentación - utilizan las herramientas del procesador de textos para buscar sinónimos, corregir ortografía y gramática, y dar formato (cuando escriben en computador)	Objetivo de Aprendizaje
340	Lenguaje y Comunicación	6th	Comunicación Oral	25	Evaluar críticamente mensajes publicitarios: - identificando al emisor - explicando cuál es la intención del emisor - identificando a quién está dirigido el mensaje (a niñas, a usuarios del metro, a adultos mayores, etc.) y fundamentando cómo	Objetivo de Aprendizaje

					llegaron a esa conclusión	
340 - 341	Lenguaje y Comunicación	6th	Comunicación Oral	29	Expresarse de manera clara y efectiva en exposiciones orales para comunicar temas de su interés: - presentando las ideas de manera coherente y cohesiva - fundamentando sus planteamientos con ejemplos y datos - organizando las ideas en introducción, desarrollo y cierre - usando elementos de cohesión para relacionar cada parte de la exposición - utilizando un vocabulario variado y preciso y un registro formal adecuado a la - situación comunicativa - reemplazando algunas construcciones sintácticas familiares por otras más variadas - conjugando correctamente los verbos - utilizando correctamente los participios irregulares - pronunciando claramente y usando un volumen audible, entonación, pausas y énfasis adecuados - usando gestos y posturas acordes a la situación - usando material de apoyo (power point, papelógrafo, objetos, etc.) de manera efectiva - exponiendo sin leer de un texto escrito	Objetivo de Aprendizaje

Mathematics and Matemáticas

Country: Estonia

Document: Appendix 3: Mathematics

Table 11 Objectives related to ICT and DL - Estonian subject Mathematics (Ministry of Education and Research, 2014)

Page	Subject/sub-subject	Grade / stage	Thematic area	Topic / No.	Evidence	Type
1	Mathematics	all basic education	1.1. Mathematics Competence	1.1 -6	be able to use information and communication technology tools for learning;	Subject Competence
7	2.1. Mathematics	1st stage - by 3rd grade	2.1.3. Mathematics Learning and Educational Objectives in the 1st Stage of Study	2.1.3 -6	can use digital study materials;	Learning and Educational Objectives
9	2.1. Mathematics	2nd stage - by 6th	2.1.5. Mathematics Learning and Educational Objectives in the 2nd Stage of Study	2.1.5 - 7	use proper study methods, if necessary finding help and information from various sources of information.	Learning and Educational Objectives
9	2.1. Mathematics	2nd stage	2.1.6. Learning Outcomes and Learning Content of Mathematics in the 2nd stage of study	2.1.6 - Calculations 11	use digital study materials and computer programmes under the guidance of the teacher and independently.	Learning Outcomes
10	2.1. Mathematics	2nd stage	2.1.6. Learning Outcomes and Learning Content of Mathematics in the 2nd stage of study	2.1.6 - Geometric Figures and Measurement 6	give examples of known geometric figures and symmetry in architecture and the fine arts by means of ICT (Internet searches and taking photographs);	Learning Outcomes

Country: Chile

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Table 12 Objectives related to ICT and DL - Chilean subject Matemática (MINEDUC, 2012)

Page	Subject/sub-subject	Grade / stage	Thematic area	Topic / No.	Evidence	Type
235	Matemática	3rd	Números y Operaciones	3	Comparar y ordenar números naturales hasta 1.000, utilizando la recta numérica o la tabla posicional de manera manual y/o por medio de software educativo.	Objetivo de Aprendizaje
235	Matemática	3rd	Números y Operaciones	6	Demostrar que comprenden la adición y la sustracción de números del 0 al 1.000: - usando estrategias personales con y sin material concreto - creando y resolviendo problemas de adición y sustracción que involucren operaciones combinadas, en forma concreta, pictórica y simbólica, de manera manual y/o por medio de software educativo - aplicando los algoritmos con y sin reserva, progresivamente, en la adición de hasta cuatro sumandos y en la sustracción de hasta un sustraendo	Objetivo de Aprendizaje
236	Matemática	3rd	Números y Operaciones	11	Demostrar que comprenden las fracciones de uso común: $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$: - explicando que una fracción representa la parte de un todo8, de manera concreta, pictórica, simbólica, de forma manual y/o con software educativo - describiendo situaciones en las cuales se puede usar fracciones	Objetivo de Aprendizaje

					- comparando fracciones de un mismo todo, de igual denominador	
236	Matemática	3rd	Patrones y álgebra	12	Generar, describir y registrar patrones numéricos, usando una variedad de estrategias en tablas del 100, de manera manual y/o con software educativo.	Objetivo de Aprendizaje
253	Matemática	6th	Números y Operaciones	3	Demostrar que comprenden el concepto de razón de manera concreta, pictórica y simbólica, en forma manual y/o usando software educativo.	Objetivo de Aprendizaje
253	Matemática	6th	Números y Operaciones	4	Demostrar que comprenden el concepto de porcentaje de manera concreta, pictórica y simbólica, de forma manual y/o usando software educativo.	Objetivo de Aprendizaje
253	Matemática	6th	Números y Operaciones	5	Demostrar que comprenden las fracciones y los números mixtos: - identificando y determinando equivalencias entre fracciones impropias y números mixtos, usando material concreto y representaciones pictóricas de manera manual y/o con software educativo - representando estos números en la recta numérica	Objetivo de Aprendizaje
254	Matemática	6th	Geometría	12	Construir y comparar triángulos de acuerdo a la medida de sus lados y/o sus ángulos con instrumentos geométricos o software geométrico.	Objetivo de Aprendizaje
254	Matemática	6th	Geometría	15	Construir ángulos agudos, obtusos, rectos, extendidos y completos con instrumentos geométricos o software geométrico.	Objetivo de Aprendizaje
254	Matemática	6t	Datos y probabilidades	23	Conjeturar acerca de la tendencia de resultados obtenidos en repeticiones de un mismo experimento con dados, monedas u otros, de manera manual y/o usando software educativo.	Objetivo de Aprendizaje

Natural Science and Ciencias Naturales

Country: Estonia

Document: Appendix 4: Natural Science

Table 13 Objectives related to ICT and DL - Estonian subject Natural Science (Ministry of Education and Research, 2014)

Page	Subject/sub-subject	Grade / stage	Thematic area	Topic / No.	Evidence	Type
1	Natural Science	All basic education	1.1. Competence in Natural Science	1.1 - 1	show interest in the environment, undertake studies on the environment and in the field of natural science and technology, and be motivated for lifelong learning;	Subject Competence
1	Natural Science	All basic education	1.1. Competence in Natural Science	1.1 - 4	make competent decisions in everyday life related to the natural and technological environment, taking into account scientific, economic, political, ethical and moral viewpoints and estimate the impact of such decisions;	Subject Competence
1	Natural Science	All basic education	1.1. Competence in Natural Science	1.1 - 5	use different information sources (including electronic) to obtain natural science- and technology-related information, analyse and evaluate the validity of the information contained;	Subject Competence
8	2.1. Science	All basic education	2.1.1. Learning and Educational Objectives	2.1.1 - 6	seek scientific information, evaluate the value of such information and write science text;	Learning and Educational Objectives
8	2.1. Science	All basic education	2.1.1. Learning and Educational Objectives	2.1.1 - 7	apply scientific- and technological knowledge and skills to everyday life;	Learning and Educational Objectives

14	2.1. Science	2nd stage	2.1.5. Learning and Educational Outcomes in the 2nd Stage of Study	Inquiry Skills 2.1.5 - 7	find science-related information from different sources and discuss the reliability of these sources of information;	Learning and Educational Objectives
15	2.1. Science	2nd stage	2.1.6. Learning Outcomes and Learning Content in the 2nd stage of study	2.1.6.1. Space - 4	find information from different sources about space on a given subject and compile and present an overview.	Learning Outcome
17	2.1. Science	2nd stage	2.1.6. Learning Outcomes and Learning Content in the 2nd stage of study	2.1.6.5. Rivers and Lakes: Water as a Living Environment - 8	compile food chains/webs for the bodies of water studied.	Learning Outcome
23	2.1. Science	2nd stage	2.1.6. Learning Outcomes and Learning Content in the 2nd stage of study	2.1.6.15. The Living Environment in Estonia - 5	compile food chains/webs that exist between different communities;	Learning Outcome

Country: Chile

Document: Bases curriculares: primero a sexto básico

Table 14 Objectives related to ICT and DL - Chilean subject Ciencias Naturales (MINEDUC, 2012)

Page	Subject/sub-subject	Grade / stage	Thematic area	Topic / No.	Evidence	Type
92	Ciencias Naturales	3rd	Planificar y conducir una investigación	c	Observar, medir y registrar datos en forma precisa, utilizando instrumentos y unidades estandarizadas, organizándolos en tablas y gráficos y utilizando TIC cuando corresponda.	Habilidad
92	Ciencias Naturales	3rd	Analizar la evidencia y comunicar	f	Comunicar y comparar con otros sus ideas, observaciones, mediciones y experiencias, utilizando diagramas, material concreto, modelos, informes sencillos, presentaciones y TIC, entre otros.	Habilidad
104	Ciencias Naturales	6th	Planificar y conducir una investigación	c	Medir y registrar datos en forma precisa con instrumentos de medición, especificando las unidades de medida, identificando patrones simples y usando las TIC cuando corresponda.	Habilidad
104	Ciencias Naturales	6th	Analizar la evidencia y comunicar	f	Comunicar y representar evidencias y conclusiones de una investigación, utilizando modelos, presentaciones, TIC e informes, entre otros.	Habilidad

Social Studies and Historia, Geografía y Ciencias Sociales

Country: Estonia

Document: Appendix 5: Social Studies

Table 15 Objectives related to ICT and DL - Estonian subject Social Studies (Ministry of Education and Research, 2014)

Page	Subject/sub-subject	Grade / stage	Thematic area	Topic / No.	Evidence	Type
13	2.1. Personal, social and health education	1st stage	2.1.4. Learning Outcomes and Learning Content in the 1st Stage of Study	2.1.4.2. Us Me: information and things - 1	describe sources of information perceived by means of different senses;ent senses;	Learning Outcome
13	2.1. Personal, social and health education	1st stage	2.1.4. Learning Outcomes and Learning Content in the 1st Stage of Study	2.1.4.2. Us Me: information and things - 2	explain how advertisements can have an impact on human behaviour and decisions and describe safe conduct in the media environment;	Learning Outcome
14	2.1. Personal, social and health education	2nd stage	2.1.6. Learning Outcomes and Learning Content in the 2nd Stage of Study	2.1. Personal, social and health education Safety and hazardous behaviour - 4	understand the risks of communication through media to their behaviour and relationships and the responsibility for one's words and actions;	Learning Outcome
21	2.2. History	all basic education	2.2.1 Learning and educational objectives	4	find, generalise, interpret, use and critically judge historical knowledge and the reliability of sources;	Learning and Educational objectives
21	2.2. History	all basic education	2.2.1 Learning and educational objectives	7	are familiar with and use different learning techniques, types of text and information sources, demonstrate their knowledge and skills both verbally and in writing and use ICT means for study.	Learning and Educational objectives

22	2.2. History	2nd stage	2.2.3. Learning and Educational Objectives in the 2nd Stage of Study	8	know that information about the past is found in historical sources, can work with simple sources and assess them critically; and	Learning and Educational objectives
31	2.3. Civics and citizenship education	2nd stage - by 6th	2.3.3. Learning and Educational Objectives in the 2nd Stage of Study	9	know how to find information that serves their purposes and interests and judge it critically, present their knowledge and opinions clearly and convincingly and are able to explain them, generate, use and r knowledge and opinions clearly and convincingly and are able to explain them, generate, use and share information and value their own and other people's work;	Learning and Educational objectives
33	2.3. Civics and citizenship education	2nd stage	2.3.4. Learning Outcomes and Learning Content in the 2nd Stage of Study	2.3.4.3. Working and consumption - 3	understand the rules of safe use of online banking and bank cards (PIN codes);	Learning Outcome

Country: Chile

Document: Bases curriculares: primero a sexto básico

Table 16 Objectives related to ICT and DL - Chilean subject Historía, geografía y ciencias sociales (MINEDUC, 2012)

Page	Subject/sub-subject	Grade / stage	Thematic area	Topic / No.	Evidence	Type
161	Historia, geografía y ciencias sociales	3rd	Historia	5	Investigar sobre algún tema de su interés con relación a las civilizaciones estudiadas (como los héroes, los dioses, las ciudades, las viviendas, la vestimenta, las herramientas tecnológicas y la esclavitud, entre otros) por medio de diferentes fuentes (libros, fuentes gráficas, TICs) y comunicar lo aprendido.	Objetivo de Aprendizaje
179	Historia, geografía y ciencias sociales	6th	Formación Ciudadana	26	Informarse y opinar sobre temas relevantes y de su interés en el país y el mundo (política, medioambiente, deporte, arte y música, entre otros) por medio de periódicos y TICs.	Objetivo de Aprendizaje

Technology and Tecnología

Country: Estonia

Document: Appendix 7: Technology

Table 17 Objectives reated to ICT and DL - Estonian subject Technology (Ministry of Education and Research, 2014)

Page	Subject/sub-subject	Grade / stage	Thematic area	Topic / No.	Evidence	Type
1	Technology	all basic education	1.1. Technology Competence	1	cope in the world of technology and use technological opportunities sensibly and creatively;	Subject competence
1	Technology	all basic education	1.1. Technology Competence	2	see and understand connections between scientific achievements and technological development and express their opinions on technological development and changes in the world of labor; and discuss how work has changed in human history;	Subject competence
16	2.2. Handicraft and Home Economics	2nd stage	2.2.4. Learning Outcomes and Learning Content of Handicraft and Home Economics in the 2nd stage of study	Technology studies in exchanged study groups - 1	appreciate the need for technological literacy in everyday life;	Learning Outcome
21	2.3. Technology studies	all basic education	2.3.1. Educational and Educational Objectives of Technology studies	1	acquire technological literacy, including development of technological knowledge and skills and satisfaction through practical self-realisation;	Learning and Educational objectives
21	2.3. Technology studies	all basic education	2.3.1. Educational and Educational Objectives of Technology studies	2	be able to make connections between people and the surrounding environment and analyse how technology influences the environment;	Learning and Educational objectives

21	2.3. Technology studies	all basic education	2.3.1. Educational and Educational Objectives of Technology studies	4	take ethical, aesthetic and sustainability convictions related to technology into account;	Learning and Educational objectives
21	2.3. Technology studies	all basic education	2.3.1. Educational and Educational Objectives of Technology studies	10	understand how technological development causes changes in the world, incl. employment opportunities;	Learning and Educational objectives
21	2.3. Technology studies	all basic education	2.3.1. Educational and Educational Objectives of Technology studies	11	have an overview of the professions in the field of technology, be able to make decisions about their subsequent learning choices and future career, value cultural heritage.	Learning and Educational objectives
22	2.3. Technology studies	2nd stage	2.3.4. Learning Outcomes and Learning Content of Technology studies in the 2nd stage of study	Technology in Daily Life - 1	appreciate the need for technological literacy in everyday life;	Learning Outcome
22	2.3. Technology studies	2nd stage	2.3.4. Learning Outcomes and Learning Content of Technology studies in the 2nd stage of study	Technology in Daily Life - 2	associate technology studies with other school subjects and spheres of life;	Learning Outcome
22	2.3. Technology studies	2nd stage	2.3.4. Learning Outcomes and Learning Content of Technology studies in the 2nd stage of study	Technology in Daily Life - 5	describe how human activities and technology influence the environment;	Learning Outcome

Country: Chile

Document: Bases curriculares: primero a sexto básico

Table 18 Objectives related to ICT and DL - Chilean subject Tecnología (MINEDUC, 2012)

Page	Subject/sub-subject	Grade / stage	Thematic area	Topic / No.	Evidence	Type
199	Tecnología	3rd	Diseñar, hacer y probar	1	Crear diseños de objetos o sistemas tecnológicos simples para resolver problemas: - desde diversos ámbitos tecnológicos y tópicos de otras asignaturas - representando sus ideas a través de dibujos a mano alzada, modelos concretos o usando TIC - explorando y combinando productos existentes	Objetivo de Aprendizaje
199	Tecnología	3rd	Tecnologías de la Información y la Comunicación	5	Usar software de presentación para organizar y comunicar ideas con diferentes propósitos.	Objetivo de Aprendizaje
199	Tecnología	3rd	Tecnologías de la Información y la Comunicación	6	Usar procesador de textos para crear, editar, dar formato y guardar información.	Objetivo de Aprendizaje
199	Tecnología	3rd	Tecnologías de la Información y la Comunicación	7	Usar internet y buscadores para localizar, extraer y almacenar información, considerando la seguridad de la fuente.	Objetivo de Aprendizaje
211	Tecnología	6th	Diseñar, hacer y probar	1	Crear diseños de objetos y sistemas tecnológicos para resolver problemas o aprovechar oportunidades: - desde diversos ámbitos tecnológicos determinados y tópicos de otras asignaturas - representando sus ideas a través de dibujos a mano alzada, dibujo técnico o usando TIC - innovando con productos	Objetivo de Aprendizaje

211	Tecnología	6th	Tecnologías de la Información y la Comunicación	5	Usar software para organizar y comunicar los resultados de investigaciones e intercambiar ideas con diferentes propósitos, mediante: - programas de presentación para mostrar imágenes, diagramas y textos, entre otros - hojas de cálculo para elaborar tablas de doble entrada y diseñar gráficos de barra simple y doble, circulares y de línea, entre otros	Objetivo de Aprendizaje
211	Tecnología	6th	Tecnologías de la Información y la Comunicación	6	Usar procesador de textos para crear, editar, dar formato, incorporar elementos de diseño, revisar y guardar un documento.	Objetivo de Aprendizaje
211	Tecnología	6th	Tecnologías de la Información y la Comunicación	7	Usar internet y comunicación en línea para compartir y publicar información de diferente carácter con otras personas, considerando la seguridad de la fuente y las normas de privacidad y de uso.	Objetivo de Aprendizaje

Informatics

Country: Estonia

Document: Appendix 10 Informatics

Table 19 Objectives related to ICT and DL - Estonian subject Informatics (Ministry of Education and Research, 2014)

Page	Subject/sub-subject	Grade / stage	Thematic area	Topic / No.	Evidence	Type
1	Informatics	all basic education	1.1. Educational Goals	1	develop the basic skills of learning and working with computer, primarily to search for information, process and analyse it, and to compile text documents and presentations;	Subject Competence
1	Informatics	all basic education	1.1. Educational Goals	2	comprehend and know how to avoid potential health, security and personal data protection threats that are likely to occur when using information and communication technology (hereinafter: ICT);	Subject Competence
1	Informatics	all basic education	1.1. Educational Goals	3	create, using ICT means, a functioning and efficient learning environment; and	Subject Competence
1	Informatics	all basic education	1.1. Educational Goals	4	participate in virtual communities and use the online environment to publish digital materials in compliance with good practice in intellectual property protection.	Subject Competence
4	Informatics	2nd Stage	2.1. Learning Outcomes and Learning Content and Learning Activities in the 2nd stage of study	1	use computers to format shorter and longer texts (for example: advertisements, posters and abstracts), adhering to the basic rules of text processing (uppercase and lowercase first letter; punctuation marks; return and spaces; text in bold, italics and underlined; superscript and subscript; word, row and paragraph spacing; text alignment; styles and	Learning Outcomes

					document templates; and lists; colours, drawings, images, charts and tables);	
4	Informatics	2nd Stage	2.1. Learning Outcomes and Learning Content and Learning Activities in the 2nd stage of study	2	find on the Internet and copy into a text file or presentation initial materials in different formats (text, images, tables and charts) and process them if necessary in compliance with good practice in intellectual property protection;	Learning Outcomes
4	Informatics	2nd Stage	2.1. Learning Outcomes and Learning Content and Learning Activities in the 2nd stage of study	3	refer to and reuse initial materials found on the Internet and in other information sources in a proper manner, avoiding plagiarism;	Learning Outcomes
4	Informatics	2nd Stage	2.1. Learning Outcomes and Learning Content and Learning Activities in the 2st stage of study	4	understand the need for critical assessment of information found on the Internet, assess the objectivity of information sources and find, if necessary, sources offering alternative viewpoints concerning the same topic;	Learning Outcomes
4	Informatics	2nd Stage	2.1. Learning Outcomes and Learning Content and Learning Activities in the 2nd stage of study	5	make skillful use of the graphical user interface of the operating system (change the window size, work switching between several windows, change content viewing modes, sort files and perform searches);	Learning Outcomes
4	Informatics	2nd Stage	2.1. Learning Outcomes and Learning Content and Learning Activities in the 2nd stage of study	6	save their work where assigned, find and open a previously saved file, save it renamed, copy files from one location to another and compare file size with the free space on the data medium;	Learning Outcomes
4	Informatics	2nd Stage	2.1. Learning Outcomes and Learning Content and Learning	7	compile a presentation on the assigned topic containing text, charts, tables, images, audio and video;	Learning Outcomes

			Activities in the 2nd stage of study			
4	Informatics	2nd Stage	2.1. Learning Outcomes and Learning Content and Learning Activities in the 2nd stage of study	8	design the presentation in a legible and aesthetically pleasing manner, taking into account these criteria among others: optimal information amount on a slide, keywords instead of connected text, source references and minimalism in design;	Learning Outcomes
4	Informatics	2nd Stage	2.1. Learning Outcomes and Learning Content and Learning Activities in the 2nd stage of study	9	compile, on the basis of received data, a data sheet, frequency tables and charts of a suitable type (column, pie or line);	Learning Outcomes
4	Informatics	2nd Stage	2.1. Learning Outcomes and Learning Content and Learning Activities in the 2nd stage of study	10	properly format these parts of an abstract: title page, automatically generated table of contents, introduction, chapters, chapter sections, drawings, tables, header and footer, summary, bibliography and annexes;	Learning Outcomes
4	Informatics	2nd Stage	2.1. Learning Outcomes and Learning Content and Learning Activities in the 2nd stage of study	11	save the completed abstract in different file formats (doc, odt and pdf), compress the file, attach it to an e-mail message and send it to the teacher, upload the file to an online environment and print it out;	Learning Outcomes
4	Informatics	2nd Stage	2.1. Learning Outcomes and Learning Content and Learning Activities in the 2nd stage of study	12	clarify how improper computer use can affect their health (addiction, aberrations in joints and posture, eye strain etc.) and know how to avoid such risks when working with computers on a daily basis: select the right sitting posture, monitor duration of computer use, take breaks for eye and wrist exercises etc.;	Learning Outcomes
5	Informatics	2nd Stage	2.1. Learning Outcomes and	13	protect their virtual identity from misuse, choosing a new	Learning Outcomes

			Learning Content and Learning Activities in the 2nd stage of study		and strong password for every online environment they access and changing passwords frequently, and do not publish sensitive personal information on the Internet;	
5	Informatics	2nd Stage	2.1. Learning Outcomes and Learning Content and Learning Activities in the 2nd stage of study	14	transfer digital photographs, video clips and audio recordings from source devices to the computer; and	Learning Outcomes
5	Informatics	2nd Stage	2.1. Learning Outcomes and Learning Content and Learning Activities in the 2nd stage of study	15	safely connect various additional devices to the computer (USB flash drive, mouse, printer and external hard drive).	Learning Outcomes

2. Learning outcomes

Appendix 2.1: Frequency of opportunity to learn digital literacy skills at school.

Table 20 Results based on students' self-reports about opportunity to learn digital literacy (OECD, 2021, p. 166)

How to detect whether the information is subjective or biased							
All students							
	How to use keywords when using a search engine such as <Google©>, <Yahoo©>, etc.	How to decide whether to trust information from the Internet	How to compare different web pages and decide what information is more relevant for your schoolwork	To understand the consequences of making information publicly available online on <Facebook©>, <Instagram©>, etc.	How to use the short description below the links in the list of results of a search	How to detect whether the information is subjective or biased	How to detect whether the information is subjective or biased
	% S.E	**% S.E**	**% S.E**	**% S.E**	**% S.E**	**% S.E**	**% S.E**
Chile	48.2 (1.0)	65.2 (0.9)	62.2 (0.9)	69.9 (0.9)	46.3 (0.9)	49.7 (0.9)	33.3 (0.9)
Estonia	63.0 (0.9)	74.8 (0.7)	67.1 (0.9)	78.2 (0.7)	56.5 (0.9)	54.1 (0.8)	53.0 (0.8)

Appendix 2.2: PISA results

Table 21 Reading (OECD, PISA 2018)

	Standard deviation	Mean Score
Estonia	93	523
Chile	92	452

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