UNIVERSIDAD DEL VALLE DE GUATEMALA
School of Education

DIGITAL SKILLS & VALUES APPLIED IN DIGITAL CONTEXTS

CURRICULAR FRAMEWORK PROPOSAL DESIGN

Graduation work as Professional Work Framework presented by Ericka Alejandra Artiga Barillas to qualify for Academic Master's Degree in Curriculum and Educational Technology

Guatemala
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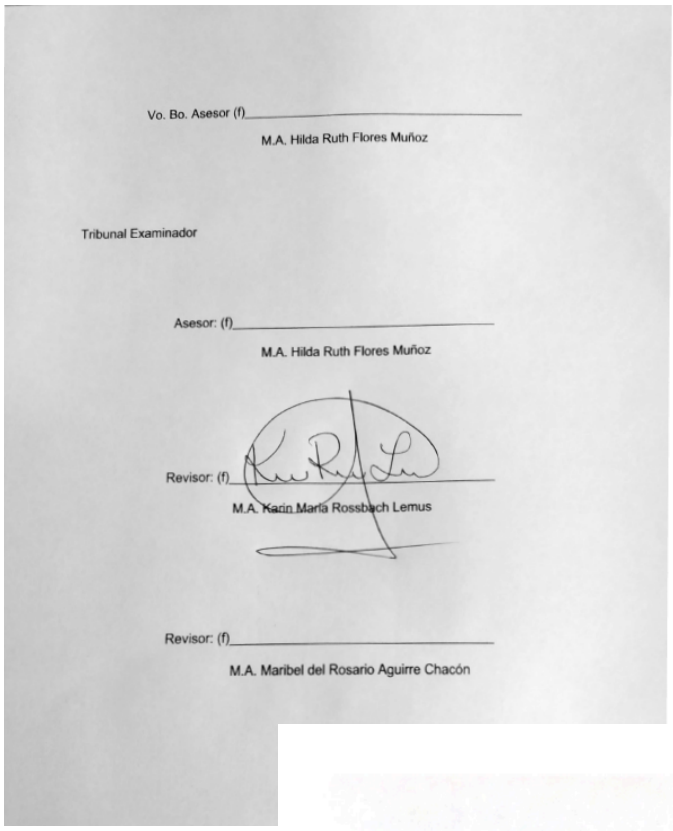
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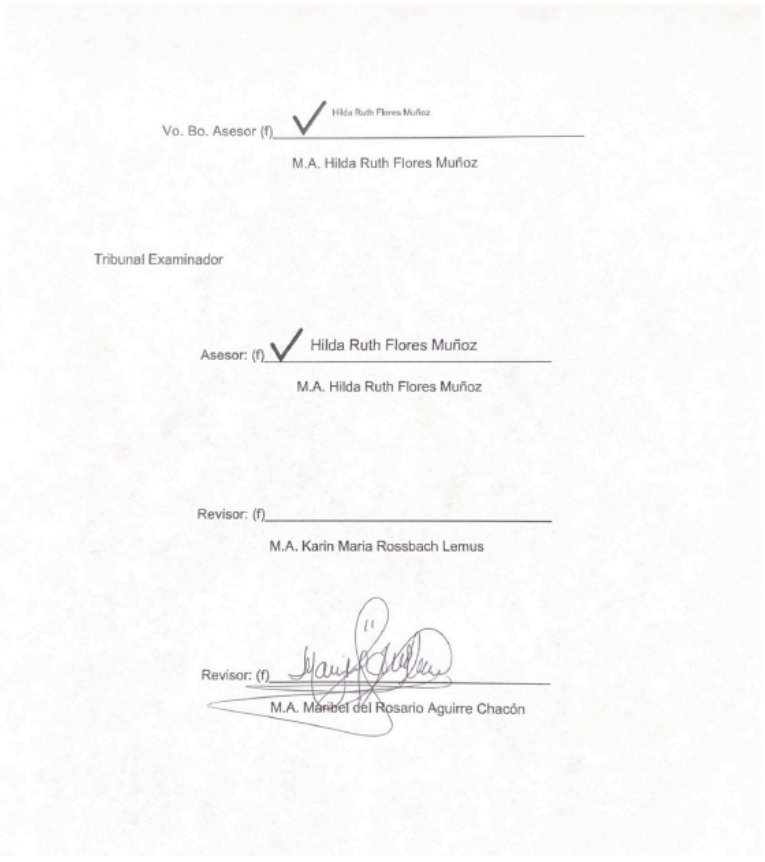
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Abstract

This professional work presents a curricular framework proposal for teaching digital skills and values at Colegio Interamericano in Guatemala. Designed using the Backwards Design model and based on international standards like ISTE and CSTA, the framework aims to help students become globally competent in an increasingly digital world. The research followed a qualitative case study approach, with input from school leaders, teachers, and students through interviews and a focus group. The curriculum is built around four key areas: Computational Thinking, Research and Information Literacy, Physical Technology, and Online & Community. Each area includes practical skills, big ideas, and guiding questions. Ethical principles, drawn from the Six Pillars of Character, are woven into the digital learning context. Feedback from participants emphasized the need for real-world application, teacher training, and interdisciplinary integration. The study recommends continuing development of the curriculum's next stages to support implementation across all grade levels.

I. Introduction

Current generations nowadays interact with digital technologies differently than previous generations. Due to the way that the current generation communicates, collaborates, uses and produces information and creates digital innovations, a new approach on technology usage has to be promoted and embraced by educational institutions (Feixa, 2014 & Guillén, 2018). Education stakeholders worldwide have an important task: rethinking and validating how learning and technology look, responding to what students really need in order to succeed in a rapidly changing world (Gardner, 2006 & Civelek, *et al*., 2017).

The Digital Skills and Values Applied in Digital Contexts professional work framework arises as part of the redefinition of technology in education's course of action, as a curriculum proposal design for Colegio Interamericano which is an accredited international school located in Guatemala. For this curriculum proposal design it was necessary to inquire into which elements and focus should the Interamericano technology curriculum have in order to be responsive to the institution's mission and vision of preparing successful global citizens (Colegio Interamericano, 2019).

The proposal was designed based on the Backwards design approach, through a set of stages such as, literature review, needs and demands research, semi-structured interviews, curricular elements crafting, and finally validated on a focus group session with the community stakeholders. Consequently, to the validation session, the information obtained in the interviews and focus groups was analyzed under a qualitative paradigm in order to ensure that the proposal design was responsive to the needs and demands expressed by the Interamericano school community.

II. General statement of the problem

Colegio Interamericano of Guatemala is an accredited international school whose primary concern, as established by the schools' mission is to prepare global citizens with the knowledge, skills, and values to lead and improve a rapidly changing world (Colegio Interamericano, 2019). However, the current curriculum design for the Technology class consists of a list of software programs paired with standards. There is a need for a better approach, in order to be aligned with the school's mission statement.

As Colegio Interamericano Technology Middle School teacher and part of the educational Technology Integration team, the researcher designing this framework strives to provide students aid and tools to develop the skills they need to succeed in the 21st century. In order to accomplish this endeavor and with the institutional support to achieve the mission of preparing global citizens, it was decided to focus this professional work on the design of a learning framework that complies with the international technology proficiency standards while aligning with the Colegio Interamericano of Guatemala Vision, Mission, and Values.

A. Research question

In that sense, this professional work framework aims to answer the following question: Which elements and focus should the Interamericano technology curriculum have, in order to be responsive to the institution's mission and vision of preparing successful global citizens?

B. Significance of the study

As Bauman, Z. (2000) stated, technology has changed the way new generations think, due to a change of their lives' approach: from a 'heavy' and 'solid' perspective of modernity focused on hardware, to modernity based on 'light' and 'liquid' focused on software. He argues in his book, *Liquid Modernity,* that change brings profound shifts to all aspects of the human condition, demanding a rethinking strategy of the concepts and cognitive frameworks used to narrate the individual human experience and its history as part of society. All these aspects are directly related to the educational system which now needs to analyze and reflect, if what is happening in the classroom is responsive to the urge in students' lives and development (Bauman, 2000).

Along with the increase in technological development and access to information, generations have changed the way they learn and their receptivity to knowledge, and as well, as the role of the student has changed, therefore the role of the teacher needs to be adapted through updating and the professionalization process (Pope, R. D., & Henseler, 2007). In addition to the update of roles between teacher and student on international contexts, Hayden, M. & Thompson, J. (2012) explain that International Education has 7 different goals in which students need to be prepared to adapt to different educational systems, embrace diversity and promote collaboration. This could be in digital contexts as well, which means that any curriculum designed for an international institution, must promote learning contexts that equip students with the skills and values to reach their highest potential locally and internationally, including digital citizenship skills needed in the real world.

This professional work framework aims to design a curriculum proposal for the technology area, responsive to the findings of the Interamericano community needs and global education requirements, expressed in the current international technology for education standards.

III. Theoretical framework

This section contains the central terms and keywords related to the Digital Skills and Values Applied in Digital Contexts curriculum that guide this proposal. This premises are the theoretical postulates such as, curriculum concept and design process, backwards design approach with its stages, and each of the proposals' axis and strands, and the legal framework in which the design is primarily based.

A. Definition of terms

1. Curriculum

Throughout the years, education professionals have been trying to define to the word curriculum and its implications, several authors from various paradigms and with different purposes. According to Taba. H, (1962) and Tyler. R, (1949), the curriculum should respond to specific needs and demand of an institution and its community. Both authors establish that the recommended process for curriculum design is the diagnosis of needs, formulation of objectives, content selection, content organization, selection of learning experiences, assessment means and design. For Gagné. R, (1967) curriculum, consists of a sequence of units of content arranged in such a way that the learning of each unit can be carried out as a simple act.

This means that the person will be able to perform the tasks provided with the capabilities described by the specific units in the sequence, skills that have already been mastered by the

student. Dewey (1994) added culture and experiences to the curriculum definition. He emphasized that curriculum means consists of a systematic transference the cultural experience of the race. Casarini, M. (2013) in her book called *"Teoría y Diseño Curricular"* defines curriculum as an expression of the means and contents of Education, that the students need to acquire and that will be shown through the learning outcomes.

Díaz-Barriga, (2005) explains that there is a difference between a curriculum model and a curricular framework. For this author, a curriculum model is a theoretical construction of some object or process that describes its operation and allows explaining and intervening in it, including the selection of the elements or components that are considered most important, as well as their relationships and forms of operation. In other words, a curriculum model consists on a strategy for the development of the curriculum enabling its concretion and location in context. On the other hand, a curriculum proposal is the specific curriculum plan, idea or project that contains various recommendations and indications, offered for a purpose, seeking a specific benefit. A proposal is usually presented to be submitted for analysis and determined whether it is convenient to carry it out in the context of the specific curricular proposal where the situated character of the chosen educational or curricular model is embodied.

For this study, a curriculum proposal will be defined as the range of understandings, skills, knowledge and values, that leads the learning experiences, based on established goals or designed standards. The purpose of this is to develop the individual's competencies in a certain amount of time. However, the curriculum model chosen for the creation of this proposal is: A standard and proficiency-based method, through the Understanding by Design approach.

2. Proficiency based learning approach

Proficiency based learning, also known as competency based learning, consists of an approach where students demonstrate that they have learned the expected knowledge and skills according to their education level (European Commission. 2006; Attard & Bujega, 2016; Hohmann, 2018).

Proficiency based learning was initially used in higher level education with the Tuning Project by the European Commission, where experts in the educational field proposed a reform on the learning outcomes in order to establish reference points among educational institutions and improve the educational quality. Tuning methodology's purpose is for student adaptation to different contexts through a set of dynamic steps on its four lines:

- identifying relevant generic and subject specific competences for elaborating a meta-profile for the subject area,
- exploring how a mutually agreed cumulative credit system can facilitate student mobility,
- exchanging good practices in approaches and techniques in teaching learning and assessment,
- exploring how quality assurance frameworks can be used at programmed level to enhance student learning (European Commission, 2006).

At the K-12 educational level, a proficiency-based learning goal is to ensure that students achieve the expected learning, while providing educators and parents detailed information about student learning progress, to identify academic strengths and weaknesses, and the specific knowledge and skills students have not yet mastered. All these data is collected from the learning experiences formative assessments. Certainly, what the training by competences is intended for people to develop broad capacities that allow them to learn and unlearn throughout their lives, knowing how to adapt to changing situations. With proficiency-based learning, education becomes student-centered which means teachers are not seen as 'deliverers' of the curriculum but facilitators of student learning (Donaldson, 2014).

3. Standard based learning approach

Standard based teaching and learning refers to the system of instruction, that includes formative and summative assessment based on the students' demonstrations of learning, understandings or mastery of certain knowledge or skills. This approach helps guide educational processes such as planning, implementation and assessment of student learning and proficiency. The guidelines that schools with the standard based approach use consists of written descriptions of what students are expected to be able to do at a specific stage of their education.

In the United States and some international schools in Guatemala, standards are used to determine academic expectations of proficiency of a skill along with the usage of certain knowledge, according to a grade or level. The standard based approach allows students to take ownership of their achievement and learning process, since standards can be met through various learning experiences and assessed multiple times until the expectations are met (Tomlinson, 2006;

Wiggins & McTighe, 2008; Heflebower, *et al*, 2016). The pursuit of international standards is a choice of educational centers in Guatemala, who, in addition to responding to the CNB, comply with these standards requirements, to provide greater opportunities for their students, through international recognition.

4. Backwards design

When developing a curriculum design, there are different models that can be used. Depending on the context and educational needs, curriculum developers choose the best fit. When referring to international schools that are aligned with the United States Common Core Standards, it is recommendable to think on a Standard-based education model, from which Backwards Design is found (Wiggins & McTighe, 2008). Wiggins & McTighe, (2008) explain in their book *Understanding by Design* that the main focus of designing backwards is to focus first on the desired outcomes and find the appropriate teaching technique later on, leading to a result-focused instead of a content-focused design.

The rationale behind this approach is that if the learning planning starts with the desired results and performances, educators focus on the actual learning experiences rather than the content coverage. In order to design a curriculum proposal with a backward approach, there are three stages:

- Stage 1: desired results
- Stage 2: acceptable evidence
- Stage 3: planning learning experiences and instruction.

The Digital Skills and Values applied in Digital Contexts proposal consists on the design of the first stage of this approach.

a. Stage 1: Desired results

The first stage of the Backwards Design focuses on formulating the desired understandings that students need to have in order to be proficient in a certain skill or learning experience. In order to define understandings, the established goals should be determined, which leads to the formulation of the essential questions, which leads to the selection of the knowledge and skills sought to be achieved (Wiggins & McTighe, 2008).

b. Established goals

The established goals are formal long term defined goals determined by a country, state, district or department; which all the questions, objectives, activities or performance indicators respond to. These can be factual, conceptual, procedural, dispositional or performance based. For the proposal curriculum design in the established goals section, several options were considered to meet the needs of the institution's mission and vision (Wiggins & McTighe, 2008). Some examples representative of educational technology established goals are the International Society for Technology in Education (ISTE), Computer Science Teachers Association (CSTA), International Computer Driver License (ICDL), European Commission Digital Competence Framework, Common Sense Education, and the Raspberry Pi Foundation Curriculum.

c. Understandings

According to Bloom (1956) an understanding as a noun is a mental construct as the result of a process of abstraction made by the human mind to make sense of distinct pieces of knowledge. As a verb, understanding is defined as the ability to gather concepts and skills on appropriate form visible on an effective application, analysis, synthesis and evaluation. In the curriculum proposal,

three kinds of understandings are included: an understanding of the big idea, overarching understandings and designed understanding per skill strand.

d. Levels of understanding

Overarching understandings encompass the knowledge and skills determined by the established goals. However, on this proposal, understanding will be shown through four levels of understanding that serve as performance indicators. These levels of understanding show how the student digital skill proficiency influences on the student overall learning. Inspired by Bloom's taxonomy, the definition of the four levels of understanding is the following:

- To learn: usage of the digital skill to acquire more knowledge and skills.
- To demonstrate learning: usage of the digital skill to perform the desired learning outcomes.
- To innovate: to create new or improve through digital skills.
- To reflect on learning: to use digital tools to mindfully think on own learning path, limitations and opportunities.

e. Essential questions

Essential questions are questions necessary for developing understanding that highlight the big ideas central to the design. These questions guide the learning experiences. The desired result is for students to pursue the question rather to answer it (Wiggins & McTighe, 2008). Some of the characteristics of essential questions are authenticity and genuine inquiry, therefore reflection is required. Essential questions avoid coverage, instead, they promote discussion, debate, problem solving, research and student reflection on learning.

f. Skills

Skills consist of discrete techniques, complex procedures and methods applications that require guided practice, feedback and coaching. The phrase the "student will be able to" refers to the skills acquired in order to achieve the performance goals. Some skills focus on how to learn and others on how to perform, from which there are different types of performances, such as: soft skills, study skills, collaboration and communication skills. The way students develop and deepen their understandings of an abstract concept, influences on how they become proficient on a set of skills (Wiggins & McTighe, 2008).

g. Content knowledge

Content knowledge refers to the body of concepts and information that students are expected to learn given a subject area, including the research, facts, principles and theories that sustain it. There is a debate between whether education should focus on content coverage and the hierarchy position of knowledge or an education based on skills. In Backwards Design, knowledge is not seen as the primary outcome but as one of the necessary components to reach the desired understanding on a specific subject or area (Wiggins & McTighe, 2008).

h. 21st Century Skills

21st Century skills consists of a wide set of knowledge, skills and habits that are considered critical for success in the real world. In an ideal scenario where students learn the most relevant and demanded skills, useful and applicable in their daily lives.

The 21st Century Skills are:

- Critical thinking, problem solving, reasoning, analysis, interpretation and synthesizing information.

- Research skills and practices and interrogative questioning.
- Creativity, artistry, curiosity, imagination and innovation, personal expression.
- Perseverance, self-direction, planning, self-discipline and adaptability, initiative.
- Oral and written communication, public speaking and presenting and listening.
- Leadership, teamwork, collaboration, cooperation and facility in using virtual workspaces.
- Information and communication technology (ICT) literacy, media and internet literacy, data interpretation and analysis and computer programming.
- Civic, ethical and social-justice literacy.
- Economic and financial literacy and entrepreneurialism.
- Global awareness, multicultural literacy and humanitarianism.
- Scientific literacy and reasoning and the scientific method.
- Environmental and conservation literacy and ecosystems understanding.
- Health and wellness literacy, including nutrition, diet, exercise, and public health and safety. (UNESCO, 2017; Battelle for Kids, 2019 & Partnership, G. 2019).

B. Study of the context

In this section there is a description of the contextual framework of Interamericano as an international school in Guatemala, its mission, vision and other details such as school profile, population and curriculum.

1. International education

International education as seen by the International Primary Curriculum, fosters the development of personal qualities such as inquiry, adaptability, resilience, morality, communication, thoughtfulness, cooperation and respect. This development occurs by establishing personal goals. The International Primary Curriculum serves students, families and teachers who belong to a "nomad community". This means that the members of this particular group won't grow roots in a specific place geographically, but to one that belongs to different kind of conglomerate: people from various locations carrying their own cultural baggage.

International students might not have the local foundations, yet they are rich in all types of knowledge from experience since they had traveled to different cultural locations. Creating and maintaining environments that make students able to ask meaningful questions, move to and from conventional and fluid forms of thinking, cope with disappointment, act on their own moral standpoints, communicate in more than the spoken language, reflect on own learning, working alongside in collaboration with peers and show acceptance and respect to others; are some of the personal goals for international curriculum designs (Elwood, C; Green V. & Cherrington, S; Hayden, M. & Thompson, J; 2009, 2010, 2012).

Besides personal goals, curriculum designs should develop in students an understanding of differences of independence and interdependence according to nationalities and beyond their own. While helping students adapt to other educational systems, international curriculum implementations, should enable students to develop national and international perspectives plus

understanding the values of similarities and differences of the vast cultural input they have been exposed to (Hayden, M. & Thompson, J.; Sanger, J.; 2012, 2019).

a. International schools in Guatemala

International Schools in Guatemala are part of the private education system and their population is mostly composed of culturally diverse students (children of diplomats, multinational corporate executives, Non-profit organizations activists, multinational families, and so on). These schools thrive to provide similar education and ease the transition of students, whether they come from a quality or accredited school. In order to be an international school, it must be accredited, these are accreditations that certify their students with the international High School diploma. Some of the accreditation and membership entities are: The CoIS (Council of International Schools), New England Association of Schools & Colleges (NEASC), Southern Association of Colleges and Schools (SACS-CASI), Association of Christian Schools International (ACSI) and National Private Schools Accreditation Alliance (NPSAA).

2. Colegio Interamericano of Guatemala

Colegio Interamericano is a private, non-profit, nonsectarian day school located in Guatemala, characterized for having a family-like atmosphere, individualized attention to students, a bilingual program and an international curriculum. In 1979, the Fundación Educativa Guatemala, composed of parents and other members of the school community, was established with the main goal of developing and sustaining educational institutions in Guatemala. The Fundación Educativa Guatemala is the owner of the school property and it is in charge of all capital development projects. Fundación Educative Guatemala appoints the Board of Directors. The school is located

in Boulevard La Montaña, Finca el Socorro zone 16, in Guatemala City, Guatemala (Colegio Interamericano, 2019).

a. Mission and Vision

The **mission** of Colegio Interamericano is to prepare global citizens with the knowledge, skills and values to lead and improve a rapidly changing world (Colegio Interamericano, 2019).

The **vision** of Colegio Interamericano is to be recognized as the best dual-diploma, internationally accredited school in Guatemala (Colegio Interamericano, 2019).

b. Six Pillars of Character

Colegio Interamericano aligns its academic instruction with the core values initiative *Character Counts* by the Michael Josephson, of the Josephson institute (Colegio Interamericano, 2019). This initiative is based on a set of six values defined by a group of youth development experts as the; "core ethical values that transcend cultural, religious and socioeconomic differences" (Character Counts, 2019). The six values are: Trustworthiness, Respect, Responsibility, Fairness, Caring and Citizenship, each of which are used as part of a program with the objective of creating and maintaining a positive school environment and culture of kindness while making schools safe environments for students to learn (Character Counts, 2019).

c. Facilities

The campus is located on 9.5 acres of terraced land and divided into five distinct areas: Early Childhood Education, Elementary School, Middle School, High School and Administration. There are 90 classrooms, 4 science laboratories, 4 computer labs, a two-story library, an amphitheater

and a cafetorium. Among the sport and recreation areas, the school has a synthetic soccer field, covered basketball and volleyball courts, early childhood and elementary playgrounds and a student's common area (Colegio Interamericano, 2019).

d. Enrollment and community

The total enrollment for the 2018-2019 school year was 1,377 students and the nationalities of the student population is made up of; 80% Guatemalan; 9% Korean; 3% U.S. American and 8% from 16 other countries. Each grade level is made up of five sections for most Early Childhood Education, Elementary and Middle School grade levels and four sections for High School with an average class size of 20 students. Colegio Interamericano educational community combines the experience and cultural background of local teachers and international visiting fellows (Colegio Interamericano, 2019).

e. Graduation requirements

Colegio Interamericano establishes minimum requirements for graduation from High School. These requirements should be seen as minimum and support regulations established by the Colegio Interamericano Board and are aligned with the national graduation requirements for *Bachillerato en Ciencias y Letras* of the Ministry of Education in Guatemala (Colegio Interamericano, 2019).

f. Calendar and schedule

The school year has a minimum of 182 student contact days (August to mid-June). For Preschool and Pre-Kindergarten, each school day is from 8:00 a.m. to 12:20 p.m. For Early Childhood Education and Elementary, each school day is from 8:00 a.m. to 2:20 p.m. Early

Childhood Education and Elementary classrooms are self-contained through grade 4. Grade 5 introduces students to the Middle School model offering multiple teachers through a rotation schedule. For grades 6-8 each school day is from 8:00 a.m. to 3:30 p.m. and is divided into a 90-minute block rotation schedule. For grades 9-12, each school day is from 8:00 a.m. to 3:30 p.m. and is divided into an 80-minute block rotation schedule (Colegio Interamericano, 2019).

g. College acceptance and memberships

All of Colegio Interamericano's graduates pursue degrees of Higher Education. Approximately 70% attend Guatemalan universities, and the remaining 30% study abroad. Colegio Interamericano is fully accredited as a PK-12 international school through AdvancEd and the Guatemalan Ministry of Education. It has memberships with Association of American Schools in Central America (A.A.S.C.A), National Association for the Education of Young Children (N.A.E.Y.C.), Association for the Advancement of International Education (A.A.I.E.), Association for Supervision and Curriculum Development (A.S.C.D.) and the Tri Association (International Schools of Mexico, Central America and the Caribbean) (Colegio Interamericano, 2019).

C. Legal framework

In order to understand the implications of a curriculum design for Colegio Interamericano as an International School in Guatemala, it is important to review the legal requirements and regulations related. Colegio Interamericano has a curriculum policy where both Guatemalan Ministry of Education and United States High School diploma requirements are considered. Guatemalan regulations according to the government agreement law 035 - 2005 establish that the

official curriculum for educational institutions is the *"Curriculo Nacional Base"* whose topics are the minimum requirement for ministry's accreditation. The agreement also establishes the grades per level and student age. The official Curriculum: *"Currículo Nacional Base"* was created as part of the curricular reform in 2003 by Guatemalan Ministry of Education in order to respond to the needs of a fair a quality education (MINEDUC, 2011).

Colegio Interamericano has a Curriculum Policy where it explains the different standards that guide instruction by subject. For PK – 12 Technology class, the established standards are defined by the International Society for Technology in Education (ISTE), (Colegio Interamericano, 2019).

The following table showcases the division by levels according to each of the requirements.

Table 1. Colegio Interamericano and Guatemalan Ministry of Education level division.

Guatemalan Ministry of Education Guatemalan High School Diploma		**Minimum Age**	**Colegio Interamericano International High School Diploma**	
Párvulos 1	*Preprimaria*	4	Prekindergarten	Early Childhood Education
Párvulos 2		5	Kindergarten	
Párvulos 3		6	First Grade	
Primer Grado	*Primaria*	7	Second Grade	Elementary School
Segundo Grado		8	Third Grade	
Tercer Grado		9	Fourth Grade	
Cuarto Grado		10	Fifth Grade	
Quinto Grado		11	Sixth Grade	
Sexto Grado		12	Seventh Grade	Middle School
Primer Curso	*Ciclo Básico*	13	Eighth Grade	
Segundo Curso		14	Ninth Grade	
Tercer Curso	*Ciclo Diversificado*	15	Tenth Grade	High School
Cuarto Bachillerato		16	Eleventh Grade	
Quinto Bachillerato		17	Twelfth Grade	

(Note: adaptation from Colegio Interamericano, 2019)

IV. Methodology

This chapter describes the methodological approach and the processes that sustain the proposal design. The professional work framework aimed to design and validate a Pre-K-12 curriculum proposal on Digital Skills and Values Applied in Digital contexts, responsive to Colegio Interamericano mission, vision, and values.

A. Proposal's scope statement

A qualitative approach as a case study, was used in this research. The objective of a case study is to obtain the richness, depth and quality of information, not quantity or standardization. When studied in a phenomenological perspective, in which the objective is to analyze the values, experiences and meanings of a social group, the use of samples from both experts and type cases is frequent (Hernandez-Sampieri, 2014). The study was Colegio Interamericano's approach and needs for their technology area, while understanding all their unique circumstances and phenomena.

The purpose of Digital Skills and Values applied in Digital Contexts professional work framework was to design and validate Stage 1 of the Pre-K - 12 Technology Curriculum for Colegio Interamericano. This framework proposal consists of an a-temporary, integrative curriculum for the Technology class. The proposal structure is composed by four main axis, eighteen strands with their overarching understandings, listed essential questions, skills and knowledge per strand. Each axis is underpinned on the international established goals/standards.

B. Objective

1. Main objective

Design a PS-12 curricular framework proposal on Applied Digital Skills and Values applied in Digital Contexts, responsive to Colegio Interamericano mission, vision and values.

2. Specific objectives

- Describe the 21st-century digital skills, knowledge, and values with a prioritized order according to the schools demand and student's needs, together with the reviewed literature.
- Design a versatile learning framework from Pre-K to Grade 12 aligned with international digital proficiency standards along with Interamericano mission and vision.
- Validate the digital skills and values applied in digital contexts framework proposal's standard-based teaching and learning approach.

C. Assumptions of the study

According to Simon, M. (2012), assumptions and limitations are key to the understanding of qualitative research and different types of studies. This professional work framework was guided by different assumptions according to each stage of the study. The research phase of the study was guided by the assumption that all of the participants answered the interview questions in an honest manner. Also, that the inclusion criteria of the Interamericano community of stakeholders are related to the design and the implementation of the curriculum proposal. The design process phase

of the study was guided by the assumption that international technology and computer science standards aim to respond to global education quality and needs.

D. Research design

The approach to the different methods, when it comes to research, depends on the aim of the study (Hernandez-Sampieri, 2014). This study was conducted from a qualitative paradigm approach. The qualitative approach is guided by significant areas or topics of research. However, instead of clarity about research questions and hypotheses, a qualitative approach dwells in assumptions.

The investigative action moves dynamically in both directions: between the facts and their interpretation. The reasoning behind the approach is due to the type of proposal. Casarini (2013), explains that the curriculum design process begins with an expressed problem or need which for this study, was taken from the initial interviews of the community stakeholders and a post - design validation meeting. The reliability within this qualitative design was ensured by a detailed examination of the transcripts using ATLAS.ti, a qualitative data analysis software.

The analysis consisted of encoding the transcripts of the validation meetings and interviews, to find the key words consistent along the discourse. This type of analysis allowed the exploration of the needs and demands together with the current related designs, all this coupled with the viewpoint of experts from different fields.

The phases for carrying out the process were the following:

- **Needs and demands:** This phase consisted of identifying the need of a curriculum, as the middle school technology teacher realized that the school required a framework for the technology class. Consequently, a meeting with the General Director of the school was held, to ask for authorization for conducting research and designing a curriculum proposal design for Technology subject followed by an electronic invitation to participate in the needs and demands interview with the aim of gaining access to Interamericano community stakeholders.

  Phase duration: 2 months

- **Literature review and needs and demands analysis:** in this phase, the collected ideas and suggested topics were arranged on a graphic organizer, while literature and other curriculum designs were reviewed and stored in a digital library.

  Phase duration: 4 months - 8 months

- **Curricular framework proposal drafting and design:** For this phase, the backwards design model was reviewed and validated with the school curricular model. The first, second & third proposal structure were drafted ending with the final proposal structure design. (Axis, strands, overarching understandings, essential questions, understandings, skills and knowledge). In addition to this, a values proposal curricular structure was designed. After the structure drafting, the international digital proficiency standards were reviewed in order to proceed with crafting Understandings, Essential Questions, Skills and Knowledges and values applied in digital contexts process.

  Phase duration: 1 month

- **Curricular framework proposal validation:** A proposal design validation meeting was held with the main stakeholders of the Interamericano community, through a focus group style meeting plus a meeting with the school's IT manager. The information was keyworded and encoded using ATLAS.ti software. Finally, the curricular proposal framework design was updated with the respective observations.

  Phase duration: 3 months

The following table presents each of the data collection and analysis methods, paired with the specific objectives.

Table 2. Objectives paired with collection and analysis methods

Specific objective	Data collection method	Data analysis method	Actors
Describe the 21st-century digital skills, knowledge, and values with a prioritized order according to the school demands and student's needs, together with the reviewed literature.	Secondary information sources review Semi-structured Interview with General Director Semi-structured interview with Principals.	List of technology for education existing curricular frameworks Suggested Topics graphic organizer.	Literature and Academic School Stakeholders: General Director Early Childhood Education Principal Elementary Principal Middle School Principal High School Principal IT Manager
Design a versatile learning framework from Pre-K to Grade 12 aligned with international digital proficiency standards along with Interamericano mission and vision.	Secondary information sources review. International standards alignment by categories.	Stage 1 design of the curriculum presented in a double entry matrix, with axis, strands and curricular elements paired with standards.	Literature and Academic
Validate the proposal's standard-based teaching and learning approach.	Interviews Focus Groups with Colegio Interamericano stakeholders	Tables Word clouds Semantic analysis	School Stakeholders: General Director Early Childhood Education Principal Elementary Principal Middle School Principal High School Principal IT Manager

(Note: Original creation)

Ethical research criteria were considered, according to Colegio Interamericano Child Protection Policy.

1. Data collection methods

Qualitative research provides textual descriptions of peoples experiences such as behaviors, beliefs, opinions and individual emotions. In order to compile this information, specific tools were used according to each specific objective (Hernandez-Sampieri, R. *et al*., 2010). This study's information collection methods were chosen in order to achieve each specific objective. Time and access to the different actors were considered as well.

2. Participants and exclusion policy

The participants of the study were purposively chosen, and the criteria was the interference they have with the proposal design, for example, the school's General Director was included on the study since she is key for decision making for the whole school. All division Principals were interviewed for the researcher to explore and understand the needs per division related to the technology course. In the validation meeting, representatives of all school stakeholders were taken into account, including the General Director, Technical Director, all Division Principals, Early Childhood and Elementary technology teachers, as well as three Middle School students. Oral and written authorizations were considered for this research (appendix). There was a no exclusion policy on this study. However, the high school Technology teacher expressed an unwillingness to attend to the focus group, for personal reasons.

3. Research reliability

To develop a rigorous research and framework aspects such as expert revision of collection tools, reliability of the sources and transferability were considered. For the revision factor the data collection tools were revised and validated by the Middle School principal. The referenced sources were found on academic search engines and online libraries, chosen from reliable sources and the information had to be relevant internationally and recent in date. For the transferability of the study, the time, place and description of the culture was included in the study of the context chapter, in order to present the actual conditions where this framework was created in case of replication interest.

V. Results: Presentation, analysis and discussion

In this chapter, the results per objective are presented with the respective analysis aligned with the reviewed literature.

A. Specific objective 1

Describe the 21st-century digital skills, knowledge, and values with a prioritized order according to the school demands and student's needs, together with the reviewed literature.

1. Prior to design interviews

Interviews with the General Director and Principals were made in order to explore the school needs in terms of technology education. The semi-structured interview had 3 sections. The first section had questions about the current curriculum, its strengths and weaknesses. Section two had questions about divisional students and teacher needs regarding knowledge, skills and values in digital contexts. The last section was about expectations principals had for the new proposal. The interview structure format can be found on the appendix part of this document.

2. Literature and research reviews

This phase consisted of an exploration and curation of the existing literature related to educational technology current needs and demands around the world. Academic search engines and databases were used to access this information and most of the articles revised were stored in a Zotero library. The following table presents the main topics addressed in the search and the frequency of the articles or resources revised.

Table 3. Revised literature collected in a Zotero library.

Main topic	Frequency
STEM/STEAM	8
Artificial intelligence	7
Computational thinking / coding	9
Connectivism	1
Curricular development	2
Digital values	1
Educational technology	5
Gamification	1
Inclusive technology classrooms	1
International schools	4
Learning theories	2
Makerspaces	3
Mixed reality	1
PBL	1
Research theory	3
Robotics	3
Systemic education	1
Technology curriculum/standards	11
Technology Integration	9
Visual Arts	1

(Note: Original creation)

3. International standards for the 21st century list

After reviewing the literature, different curricular initiatives related to educational technology and skills, that educational institutions must take into account to educate 21st century students, were found. Some of those initiatives are curricular frameworks with their own standards, developed by institutions for example, Google for Education and Common-Sense Education. Other initiatives consisted of established standards such as the ones from the International Society for Technology in Education ISTE, Computer Science Teachers Association, International Computing Driving License, and the European Commission.

The following table presents a listing of organizations who developed curriculum and their standards utilized on this part of the study:

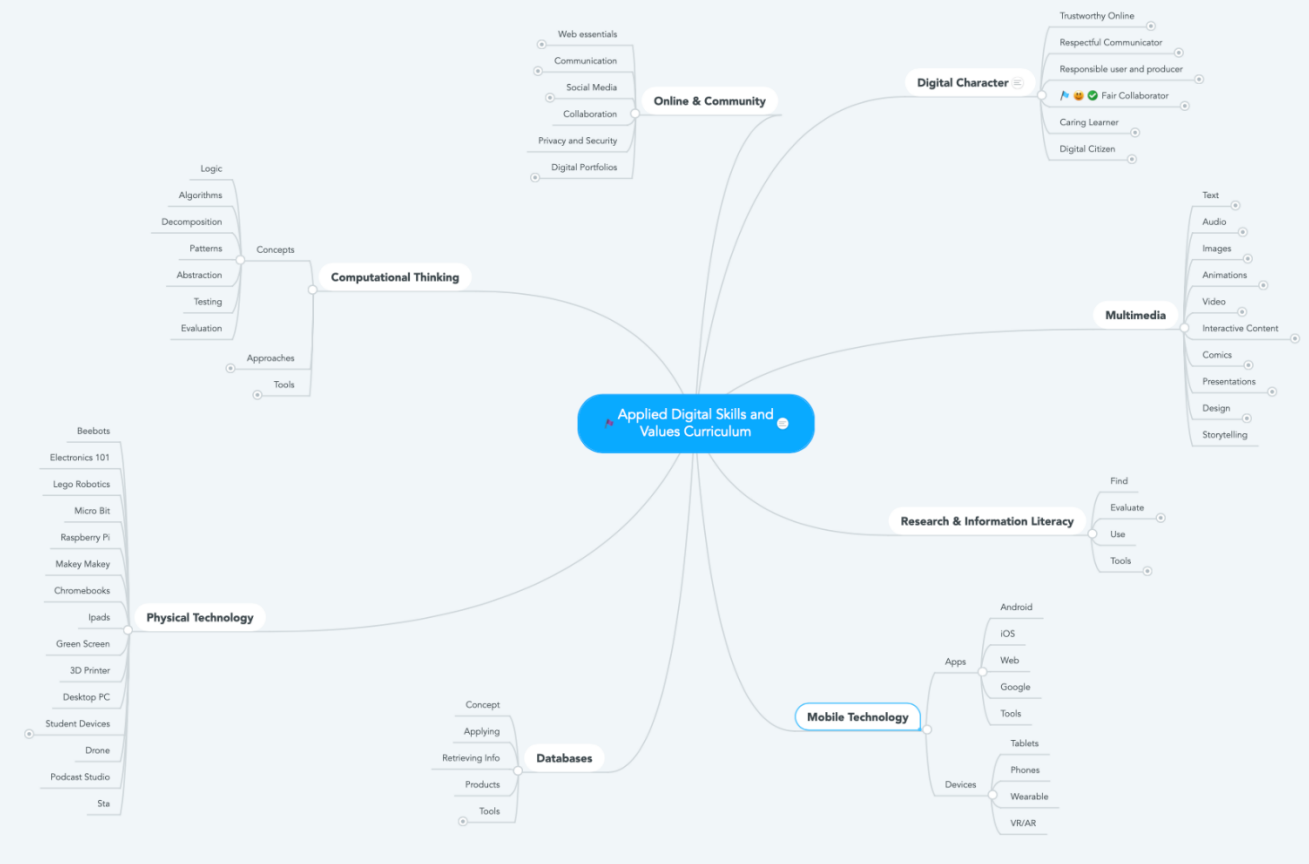
Table 4. Existing technology curricular designs and established standards

Developer / Organization	Description
International society for technology in education standards for students (ISTE)	List of seven standards designed to empower student voice and ensure that learning is a student-driven process.
Common sense media curriculum /Digital citizenship	K-12 Digital citizenship curriculum aligned with ISTE standards.
Applied digital skills from google	Curricular framework developed by google to help teachers and students' learning process with Google Suite tools.
CS first curriculum	A free curriculum that facilitates the teaching of programming and makes it fun to learn.
Six pillars of character initiative	A program based on six core values with the objective of creating and maintaining a positive school environment and culture of kindness while making schools safe environments for students to learn.
Raspberry Pi curriculum	A computational thinking curriculum designed by Raspberry Pi foundation in order to help teachers and students learn and use computational thinking skills.
Computer science teachers association (CSTA)	Delineate a core set of learning objectives designed to provide the foundation for a complete computer science curriculum and its implementation at the K–12 level.
International computing driving license (ICDL)	ICDL Foundation is an international organization dedicated to raising digital competence standards in the workforce, education and society. The standards from ICDL used belonged to the Asia area.
European commission digital competence framework for citizens	The European digital competence framework for Citizens offers a tool to improve citizens' digital competence.
National geographic learning framework/ attitudes	National Geographic has developed a learning framework around a set of attitudes, skills, and knowledge that embody the attributes of an explorer.

(Note: Original creation)

The retrieved information from the interviews and research exploration was classified into categories according the skills, topics, sources and needs and organized in a map. Figure 1 shows the first three levels of the map created. (To see the full Graphic Organizer go the link: http://tiny.cc/nzaegz)

Figure 1. Discovered topics and needs map



(Note: Original creation)

B. Specific objective 2

Design a versatile learning framework from Pre-K to Grade 12 aligned with international digital proficiency standards along with Interamericano mission and vision.

The final version of the curriculum proposal design is displayed, according to the Backwards Design format based on the Standard-based & competencies curriculum model (Tomlinson. C., 2006; Wiggins & McTighe, 2008 & Heflebower, T., 2016).

The proposal will be shown by axis and strand per axis. Each strand has the designed Overarching Understanding, that establishes the strand's big idea. Below, the specific Understandings, Essential Questions, Knowledge and Skills necessary for the student to be proficient in the skill strand.

1. Axis and strands

The curriculum proposal is structured in a vertical and horizontal manner, in order to clearly classify the different digital skills and their understanding. The digital skills and values proposal is divided horizontally in axes, an axis is a fixed reference of an overarching topic. The design's 4 axes are: computational thinking, research & information Literacy, physical and technology and online & community. Each of these axes is divided vertically into strands. A strand is a fiber that belongs to a cord or string, for what in this design, the strands are the vertical components of each one of the axes (Wiggins & McTighe, 2008).

All of the above sustained by the international established goals, such as the standards defined by the International society for technology in education (ISTE), Computer science teachers

association (CSTA), International computer driver license (ICDL), European commission digital competence framework, Common sense education, and the Raspberry Pi foundation curriculum.

The following table show the structure of the curricular framework proposal.

Table 5. Curricular framework proposal structure

<table>
<tr><td colspan="3">AXIS

-the integration of main skills and topic phrased in understandings -</td></tr>
<tr><td colspan="2">Design understanding

-the overarching description of what students have to understand in order to achieve the skill-</td><td rowspan="4">Established goals/ standards

-the collected international standards related to the overarching topic. -</td></tr>
<tr><td colspan="2">Strand

-vertical component for each one of the axis-</td></tr>
<tr><td>Understandings

-what students need to understand in order to be proficient on the skill-</td><td>Essential questions

-lead students on a critical insight on the topic, does not need to be answered-</td></tr>
<tr><td>Knowledge

-the suggested topics-</td><td>Skills

-the skills needed to be proficient at in order to achieve the desired understanding-</td></tr>
</table>

(Note: Original creation)

This figure shows the four Axes with their overarching understandings and respective strands.

Figure 2. Curriculum map by axis and strands

AXIS	Computational Thinking					
Design Standard/ Understanding	Understand how technology works and make reliable predictions about its future behavior.	Understand how sets of instructions for a destinated outcome are used to solve real world problems.	Understand the process of solving problems by breaking them down into systematic components for developing solutions.	Understand how does the process of hiding all but the relevant data about a program reduce complexity and increase efficiency.	Understand the process intended to measure the quality, performance and reliability of a design solution, before it is final use.	Understand the incorporation of digital tools for the representation and execution of programs when solving real world problems.
Strand	Logical Reasoning	Algorithming	Decomposing	Abstraction	Testing	Simulation/ Representation
AXIS	Research & Information Literacy					
Design Standard/ Understanding	Understand to what extent research strategies can facilitate the achievement of the information goals.	Understand the quality, reliability and perspective of information, based on the source and evaluation criteria.	Understand and embrace the implications of using retrieved data, media or information.	Understand the trasformation of ideas into innovations considering the rights and obligations as creators, while sharing via multiple platforms	Understand the usage of databases to predict outcomes and make informed decisions.	Understand how to build solutions to real-world problems by choosing the right digital tools and appropiated software.
Strand	Efficient Access	Nature, extent & evaluation	Responsible Usage	Aware Production	Databases	Multimedia & Design
AXIS	Physical Technology					
Design Standard/ Understanding	Understand how mobiles and computing devices work together with software to achieve goals, and that their kinds are intended to different purposes or audiences.			Understand why prototyping enhances meaningful learning experiences of technological concepts.		
Strand	Devices & Mobile Tech			Invention Kits & Robotics		
AXIS	Online & Community					
Design Standard/ Understanding	Understand how the web works and its impact on their everyday lives.	Understand digital technologies input on the development of positive communication and collaboration interactions.		Understand that living in an interconnected world has benefits and implications, the most effective way to embrace them is acting in a way that is safe, legal and ethical.	Understand the importance of self-reflecting before, during and after self - revealing.	
Strand	Web Essentials	Communication & Collaboration		Privacy & Security	Digital Portfolios	

(Note: Original creation)

2. Axis 1 - Computational thinking

Computational thinking is a problem-solving approach that consists of viewing the problem as a whole, finding the best set of steps to solve it, breaking into parts, abstracting its complexity, proposing and testing solutions to finally apply them.

Since automation of human tasks is becoming more and more common, skills that involve the human quality of problem solving are fundamental for global citizens. The following images correspond to axis one and its six strands: Logical Reasoning, Algorithming, Decomposing, Abstracting, Testing and Simulation.

Figure 3. Computational thinking axis

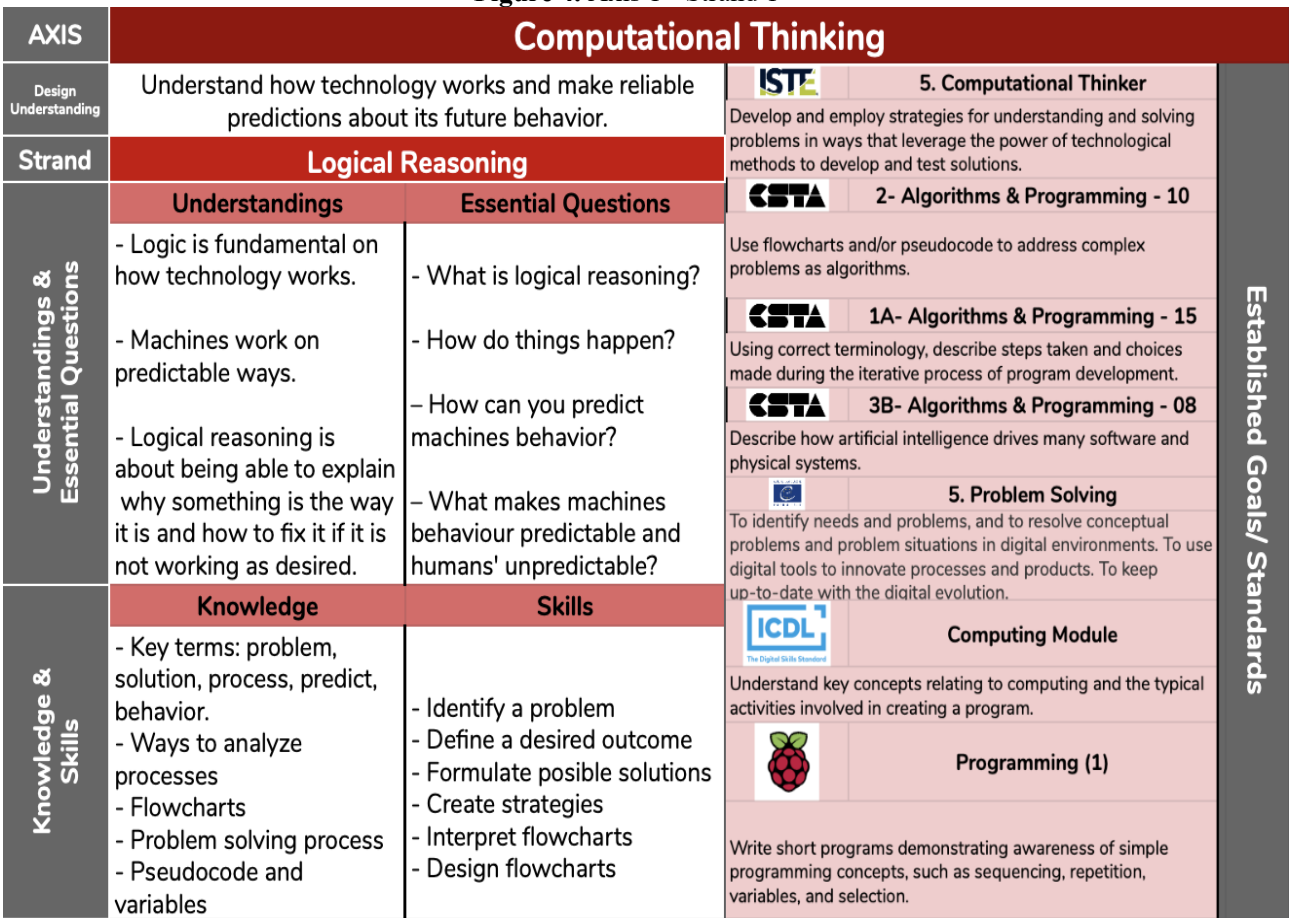
AXIS	Computational Thinking					
Design Standard/ Understanding	Understand how technology works and make reliable predictions about its future behavior.	Understand how sets of instructions for a destinated outcome are used to solve real world problems.	Understand the process of solving problems by breaking them down into systematic components for developing solutions.	Understand how does the process of hiding all but the relevant data about a program reduce complexity and increase efficiency.	Understand the process intended to measure the quality, performance and reliability of a design solution, before it is final use.	Understand the incorporation of digital tools for the representation and execution of programs when solving real world problems.
Strand	Logical Reasoning	Algorithming	Decomposing	Abstraction	Testing	Simulation/ Representation

(Note: Original creation)

a. Strand 1 - Logical reasoning

The logical reasoning strand refers to the understanding of how things work and what predictions can be made from objects, machines and programs behavior. These predictions can help the student troubleshoot and fix systems that are not giving the desired results. The criteria to categorize standards under the logical reasoning umbrella, was if they were related to problem solving, understanding of technological processes, identifying needs and explaining problems.

Figure 4. Axis 1 - Strand 1

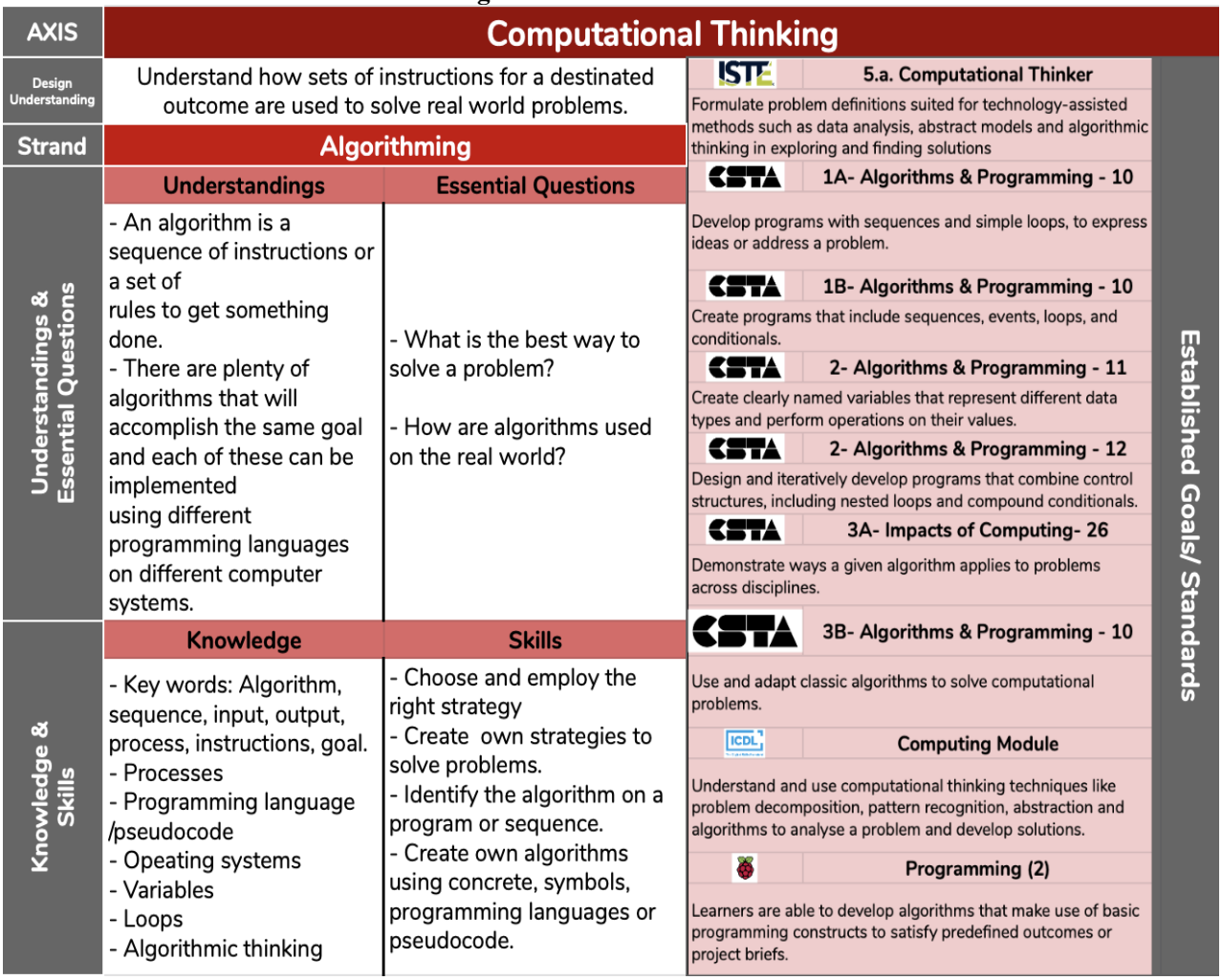


(Note: Original creation)

b. Strand 2 – Algorithming

Algorithming refers to the process of creating sets of instructions that solve one or more complex problems. The skills to master this strand are related to problem solving creating own sequences and finding the best set of steps to make that problem-solving process more effective. The established goals related to algorithming were selected if they were related to sequences, loops, formulating solutions and identifying algorithms.

Figure 5. Axis 1 - Strand 2

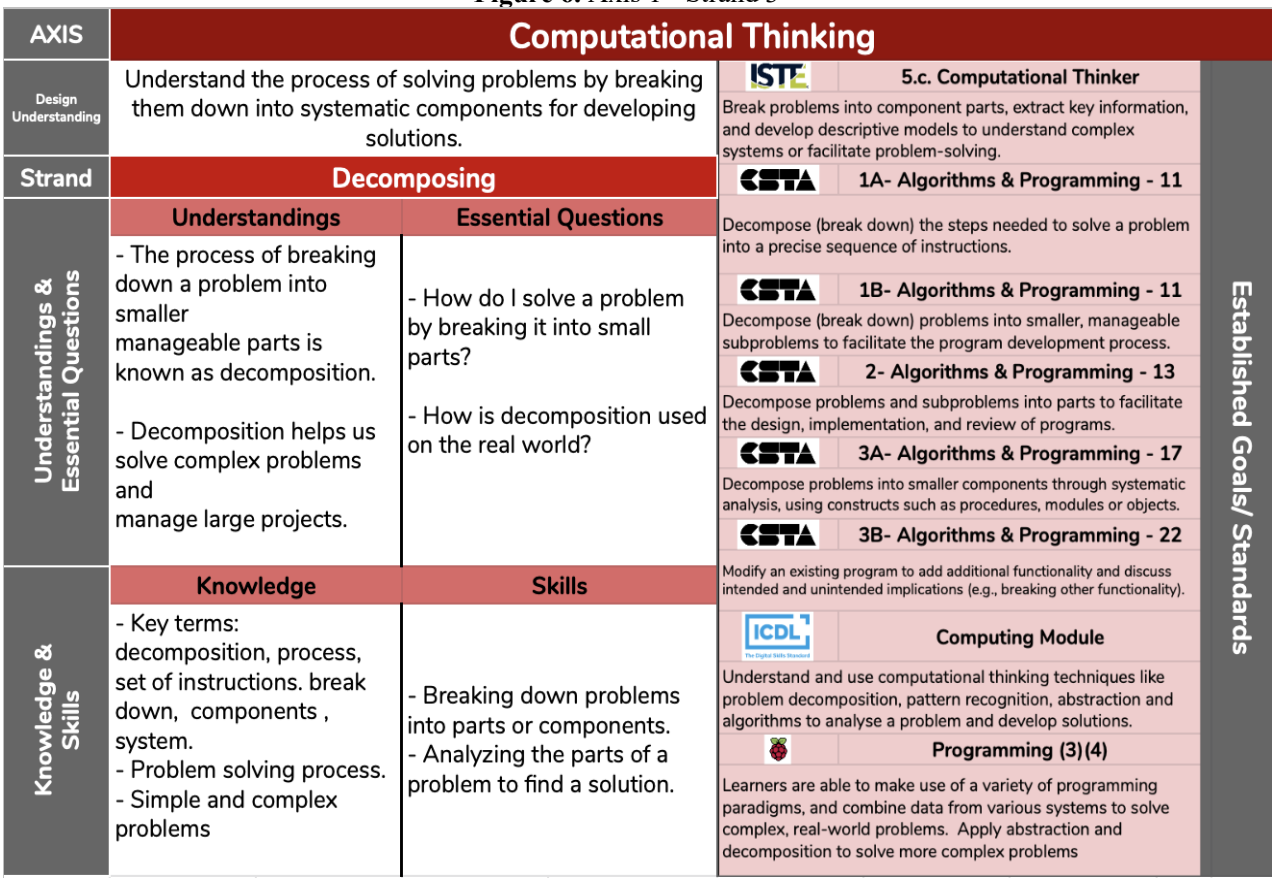


(Note: Original creation)

c. Strand 3 – Decomposing

In the real world there are simple and complex problems. Simple problem solving might need simple or one-way solutions, but complex solving process might need more than one step. In this strand, decomposing is the act of solving problems by breaking them down into components and analyzing each to find or create a solution. The established standards chosen to substantiate this strand are related to breaking complex problems into parts to find solutions.

Figure 6. Axis 1 - Strand 3



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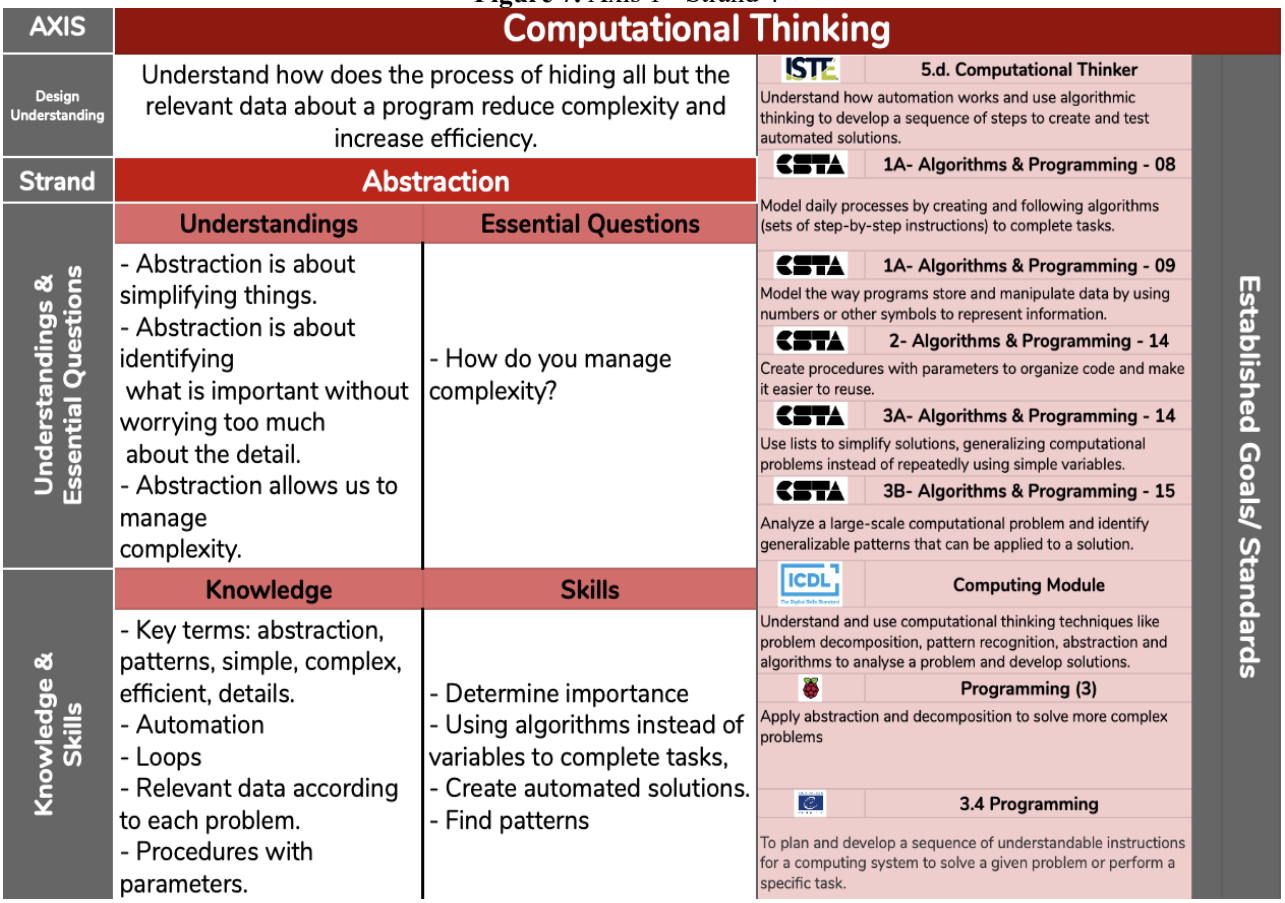
d. Strand 4 – Abstraction

Abstraction consists in isolating an element from its context or from the rest of the elements that accompany it. In programming, the term refers to the emphasis on the "how" instead of the "what".

This process reduces complexity and increases solving efficiency. The established goals in this strand relate to understanding the big picture of things, finding and isolating components to find the key to a solution.

Figure 7. Axis 1 - Strand 4

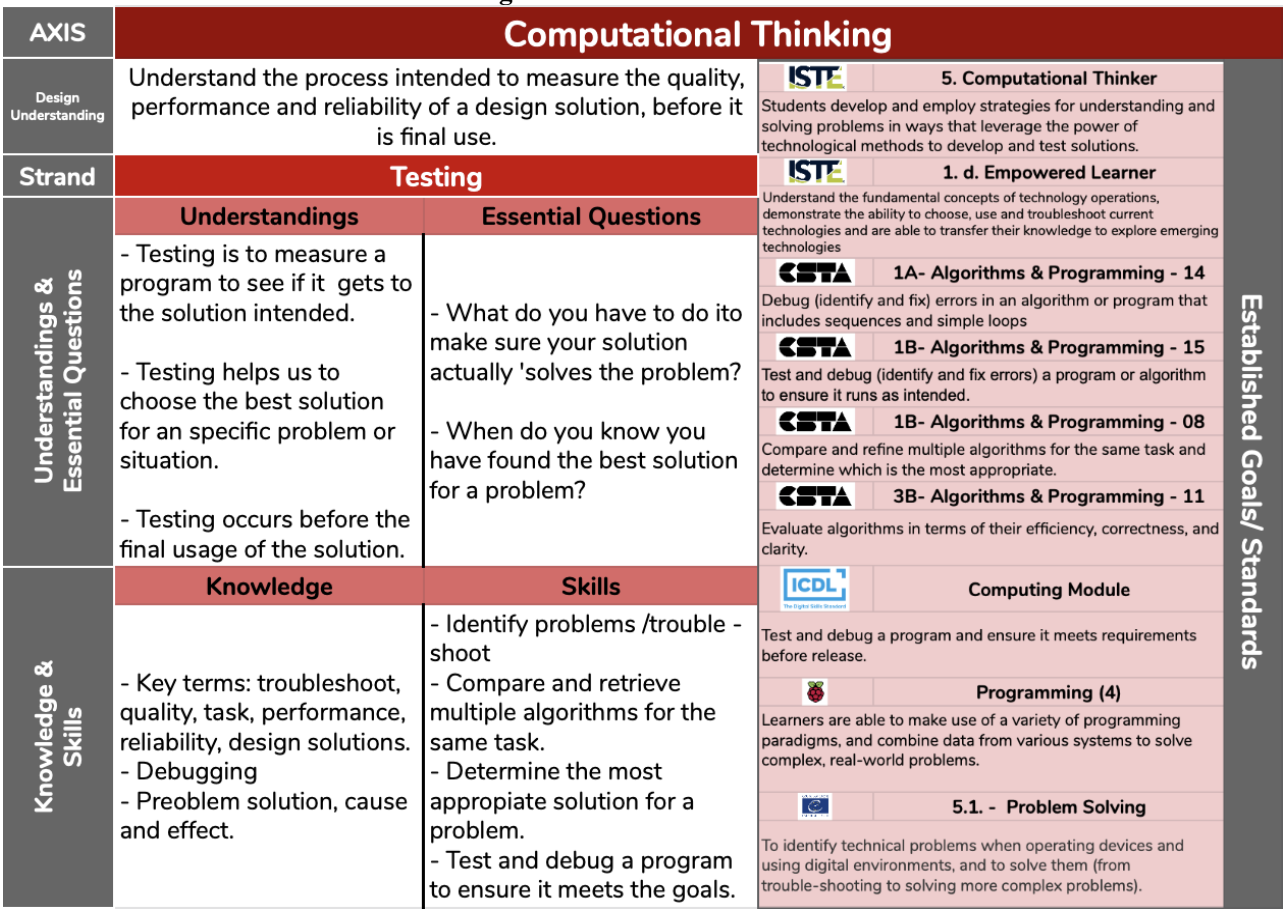


(Note: Original creation)

e. Strand 5 – Testing

Testing is measuring the quality, functionality, and reliability of a created solution. It is in the testing stage where behaviors are observed, data is collected, and informed decisions are taken. The established goals that substantiate this strand are related to trial and error processes and solution evaluation.

Figure 8. Axis 1 - Strand 5

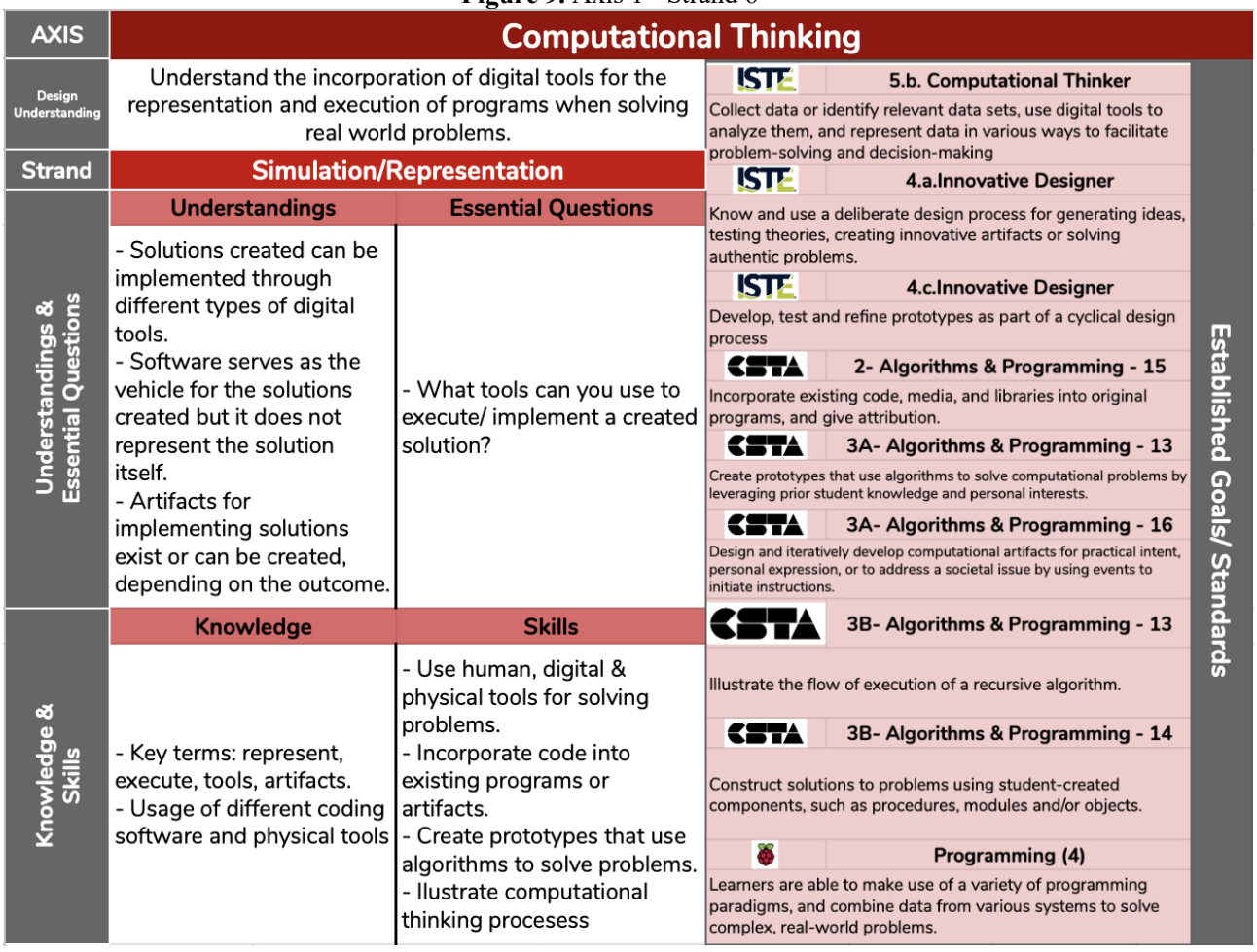


(Note: Original creation)

f. Strand 6 – Simulation/Representation

It is in this strand where the solutions are executed and taken for solving problems in the real world. Prototyping also occurs in this stage, since the programs are already tested and debugged. The established goals in which this strand is based are related to the real-world problem solution, retesting and prototyping artifacts that execute the created programs.

Figure 9. Axis 1 - Strand 6



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3. Axis 3 – Research and Information Literacy

Nowadays, having access to information is a simpler task than it was in the past. The amount of information digital citizens are exposed to is greater than it was before. Global citizens need strategies to access information in the most effective way, evaluate the obtained information, use, reuse and produce content responsibly, being guided by the principles of copyright. The following images correspond to Axis 2 and its six strands: Efficient Access, Nature - Extent and Evaluation, Responsible Usage, Aware Production, Databases, Multimedia and Design.

Figure 10. Research and Information Literacy Axis

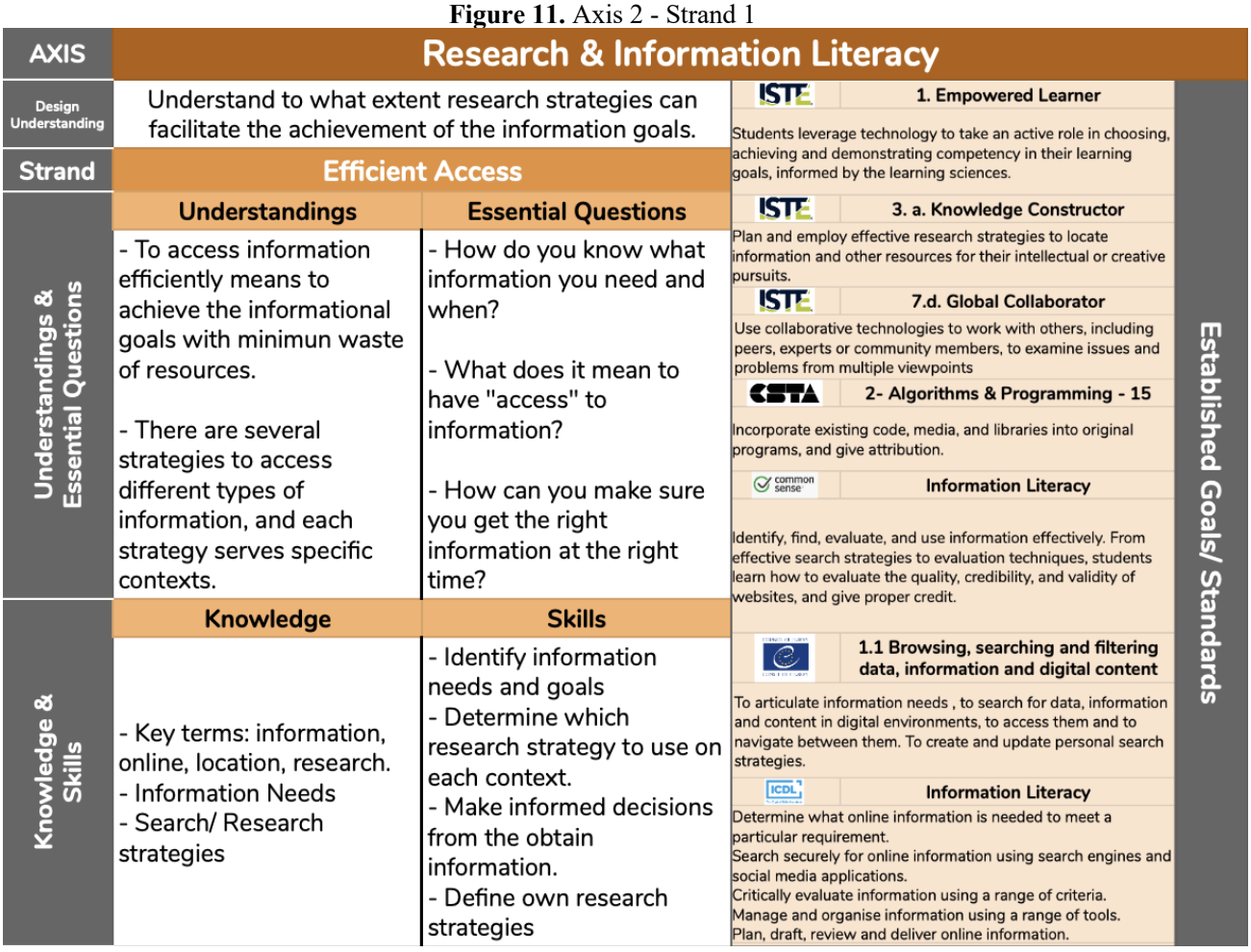
AXIS	Research & Information Literacy					
Design Standard/ Understanding	Understand to what extent research strategies can facilitate the achievement of the information goals.	Understand the quality, reliability and perspective of information, based on the source and evaluation criteria.	Understand and embrace the implications of using retrieved data, media or information.	Understand the trasformation of ideas into innovations considering the rights and obligations as creators, while sharing via multiple platforms	Understand the usage of databases to predict outcomes and make informed decisions.	Understand how to build solutions to real-world problems by choosing the right digital tools and appropiated software.
Strand	Efficient Access	Nature, extent & evaluation	Responsible Usage	Aware Production	Databases	Multimedia & Design

(Note: Original creation)

a. Strand 1 – Efficient access

Students are exposed to an extensive amount of information these days, which means students need strategies to access to the right information at the right time. How do students know what information they need and when? This strands' understanding aim to answer this and other questions. The established goals that back up this strand are related to the access to information and the effective strategies for students to use, learn and create.

Figure 11. Axis 2 - Strand 1



(Note: Original creation)

b. Strand 2 - Nature, extent and evaluation

Producing information in the current era seems a simple task for any person with access to the web. The real challenge is to be able to scrutinize among all of the information to determine if the sources are useful and reliable. This strand refers to the skill of evaluating the nature and extent of the information to determine if it responds to the user's needs. The established goals that substantiate this strand relate with the access, curation and evaluation of any kind of information.

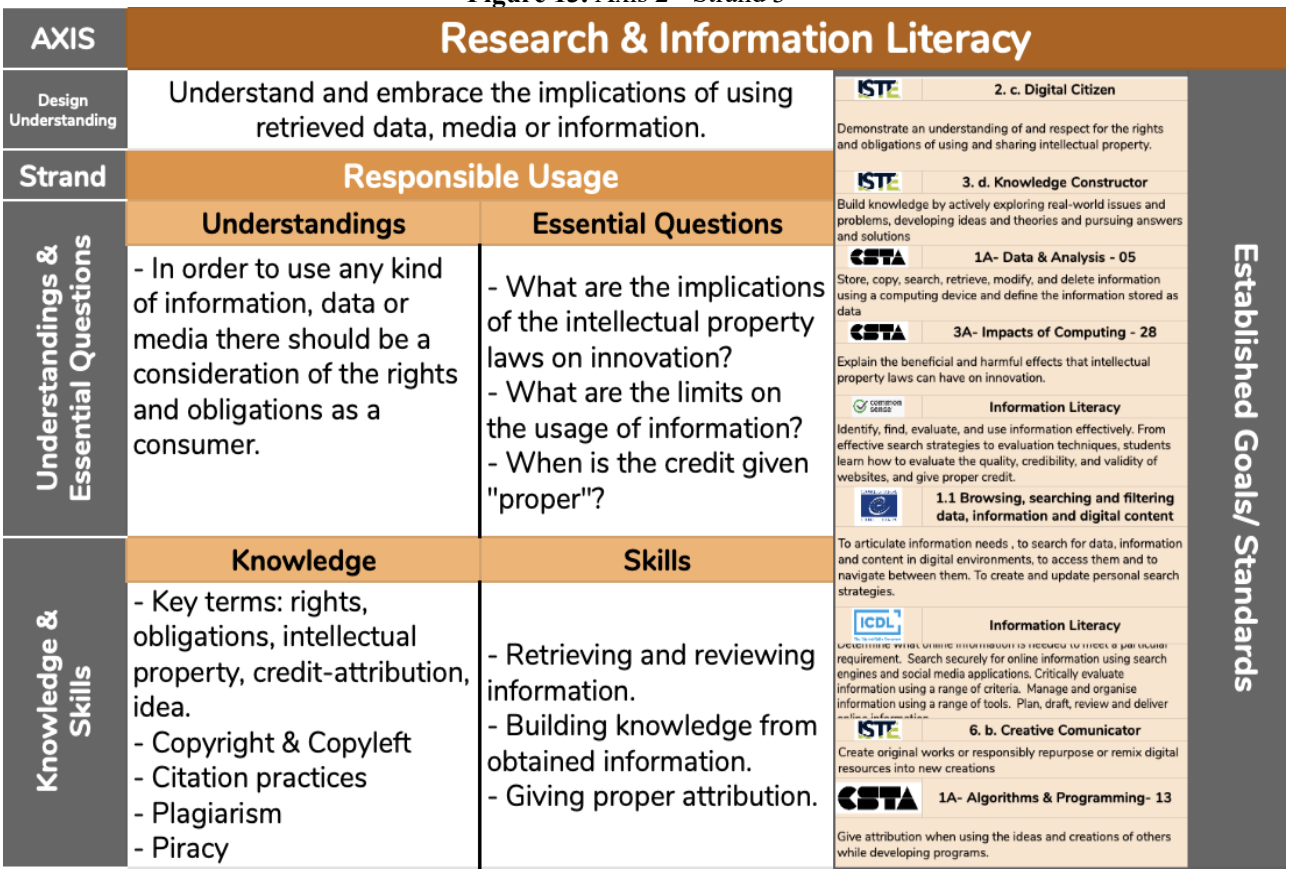
Figure 12. Axis 2 - Strand 2

(Note: Original creation)

c. Strand 3 – Responsible usage

Online media and information can be easily found. Rapid access to information facilitates its use, making it necessary to create a culture of responsible usage of information. This strand aims for students to align their information usage with the international rules and regulations that establish their rights and responsibilities as digital citizens.

Figure 13. Axis 2 - Strand 3



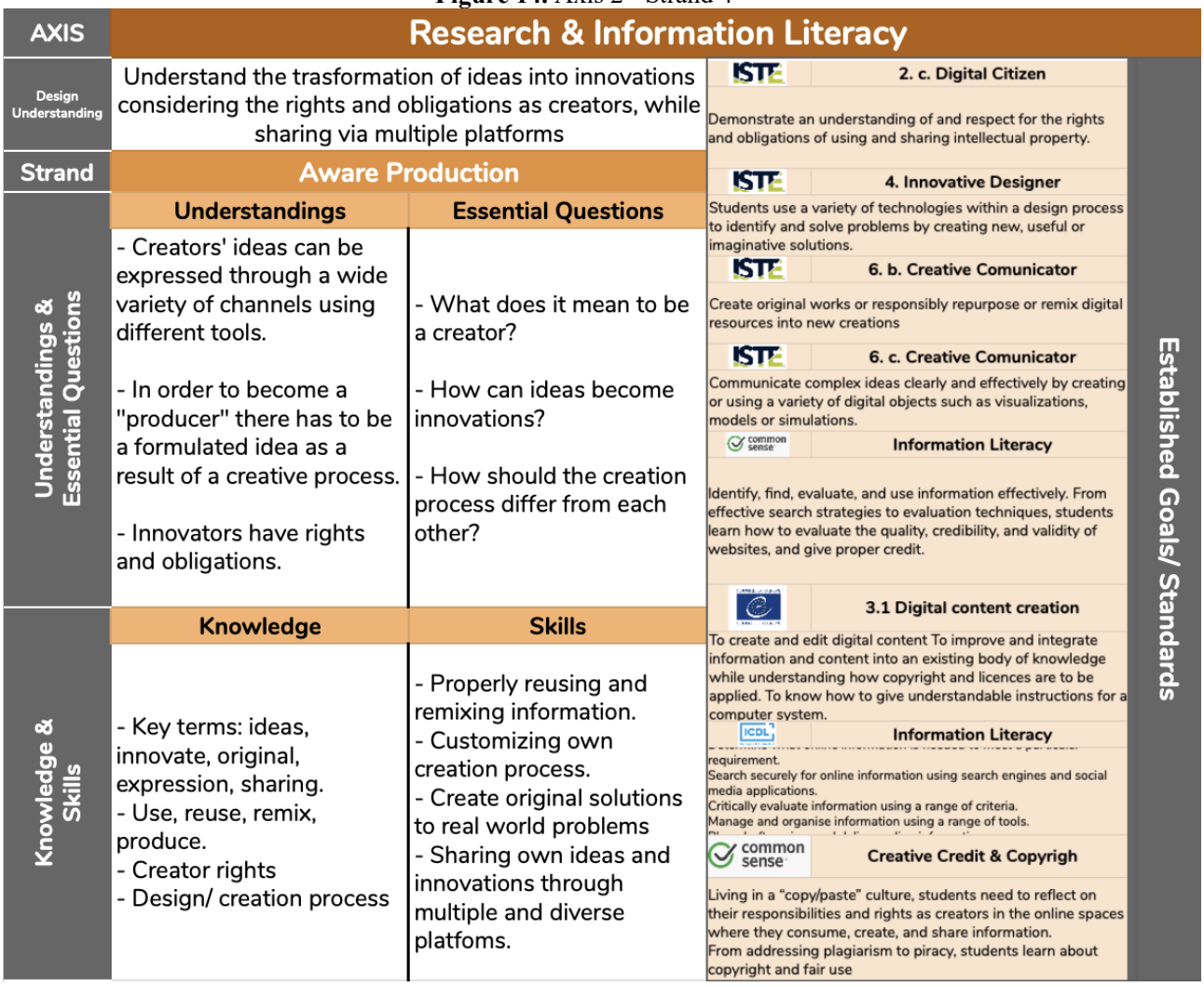
(Note: Original creation)

1.

d. Aware production.

Creating media content implies to be aware of the rights and responsibilities as a creator. This strands objective is for students to explore the creative process integrating technology while being aware of the online world rules and digital citizenship standard regulations. The established standards that relate to this strand include words like creating, communicating, creators' rights and responsibilities.

Figure 14. Axis 2 - Strand 4

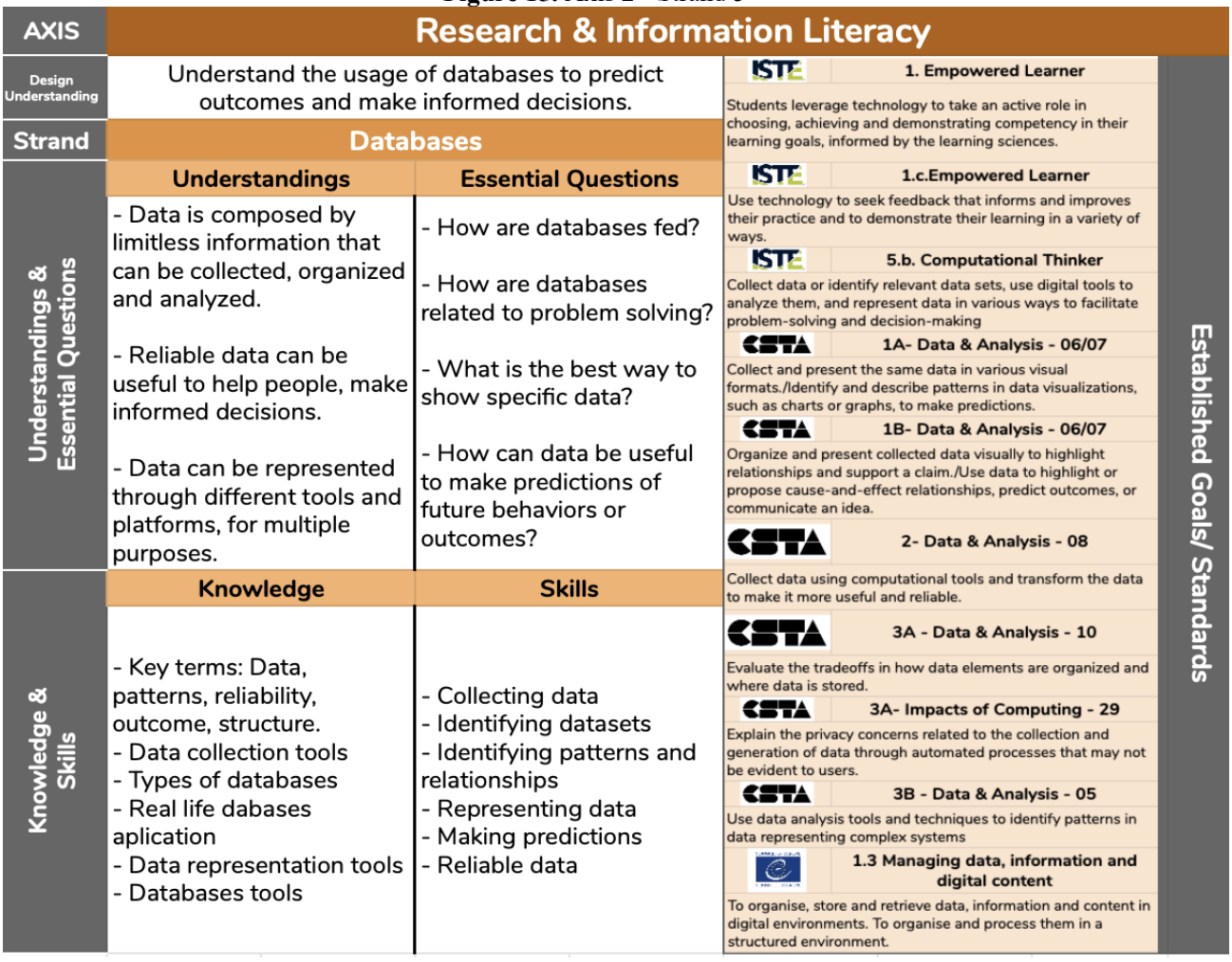


(Note: Original creation)

e. Strand 4 - Databases

Information is collected in different times and manners. After the gathering, data is collected in databases shaped by the aim and the tool of collection. Databases are useful for students to have a better understanding of the world and for making informed decisions, being this the "why" of the Databases strand. The established goals that support this strand are related to the collection, organization, presentation of data, as well as the relationship among it.

Figure 15. Axis 2 - Strand 5

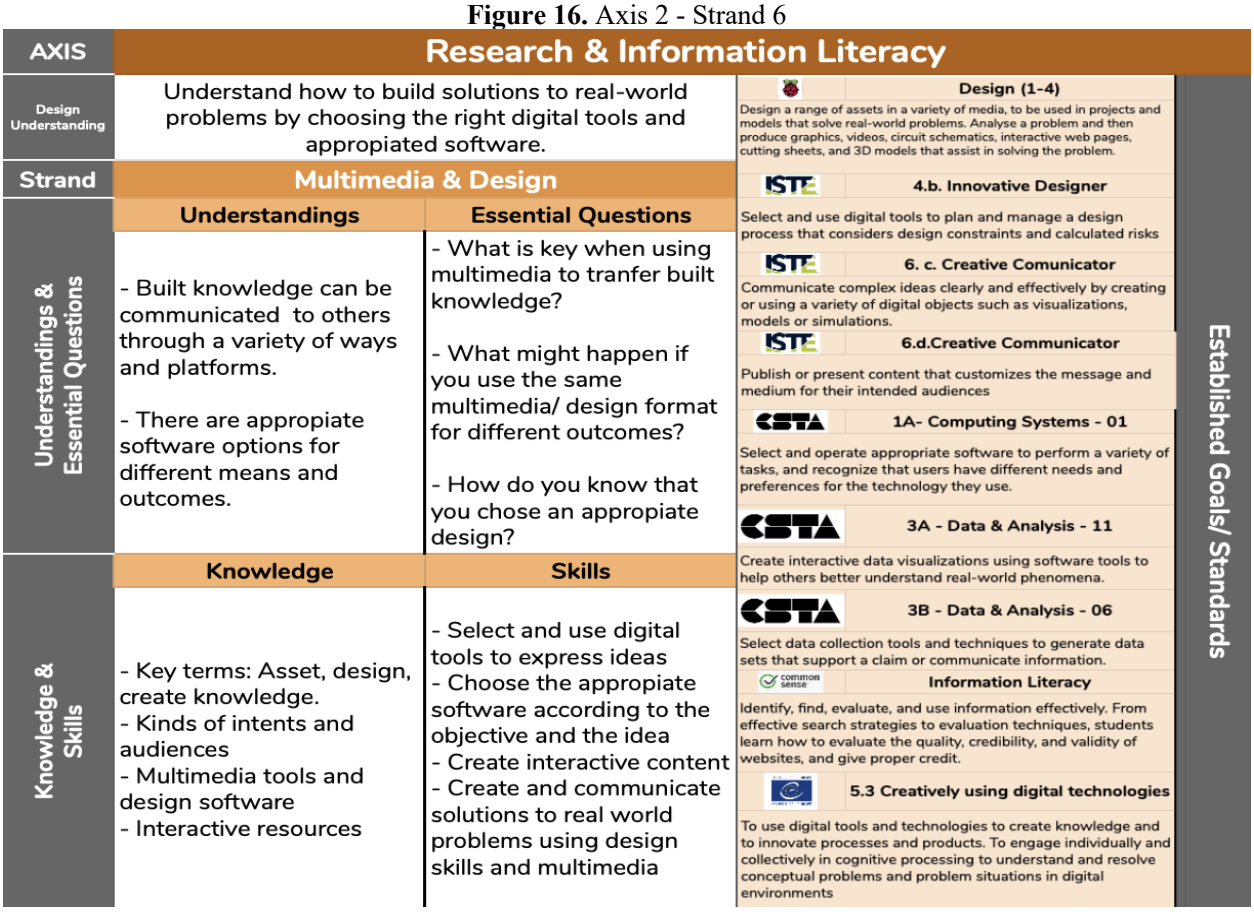


(Note: Original creation)

f. Strand 5 – Multimedia and design

After the gathering, organization and evaluation of data, as producers of digital content, students need to understand how to choose the right digital tools according to their audience and purpose. There are different types of software for creating this type of content, but in the Multimedia & Design strand, students will explore the basic creator apps, and deepen the knowledge of in how to get to know new tools by learning about software usage. The established goals that justify the inclusion of this strand in the framework are related to digital content, media, real-world audiences and creating knowledge from collected information.

Figure 16. Axis 2 - Strand 6



(Note: Original creation)

4. Axis 3 - Physical technology.

When it comes to digital technology, not everything is software. Hardware or physical technology plays an important role in everyday situations because it's hardware what allows humans to interact with software. The Digital Skills curriculum proposal has two strands that cover the basic skills needed related to physical technology.

The following images correspond to Axis 3 and it two strands: Devices & mobile tech and invention kits & robotics.

Figure 17. Invention kits and robotics axis

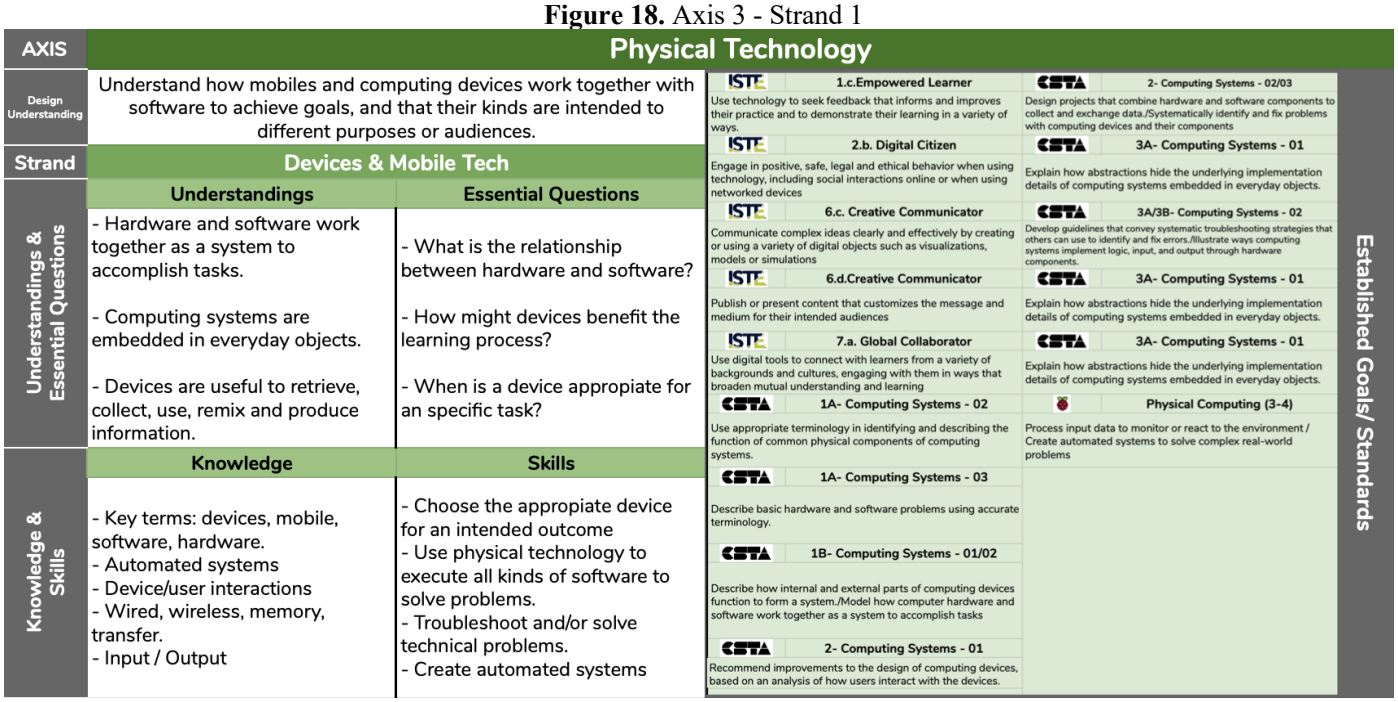
AXIS	Physical Technology	
Design Standard/ Understanding	Understand how mobiles and computing devices work together with software to achieve goals, and that their kinds are intended to different purposes or audiences.	Understand why prototyping enhances meaningful learning experiences of technological concepts.
Strand	Devices & Mobile Tech	Invention Kits & Robotics

(Note: Original creation)

a. Strand 1 – Devices and mobile technology

Devices, nowadays, more than a tool, represent an extension of human scope and capacity. Technology is composed of hardware and software used to achieve different purposes and with the capacity of translating human input into intended outcomes. The established goals that substantiate this strand are related to the correct usage of devices and troubleshooting skills in order to achieve a specific task.

Figure 18. Axis 3 - Strand 1

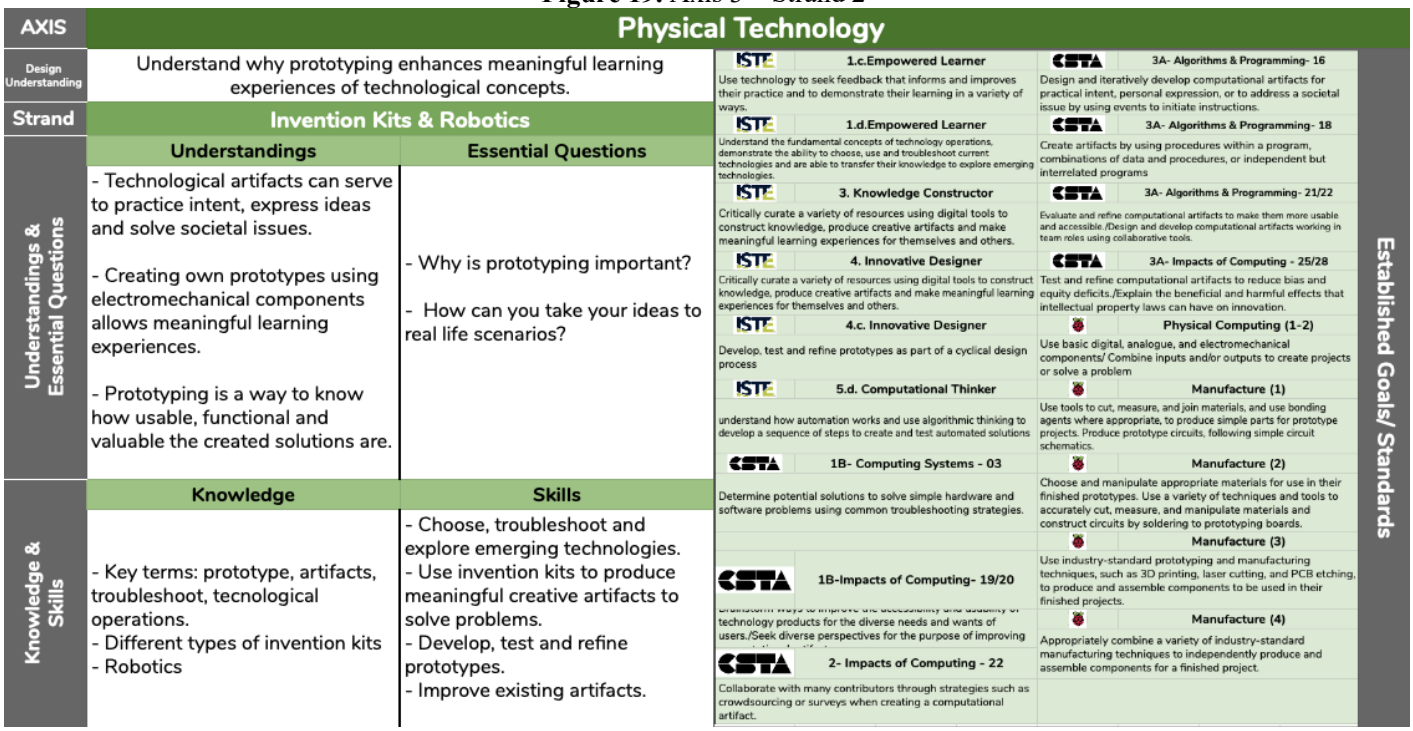


(Note: Original creation)

b. Strand 2 – Invention kits and robotics

The creative process is not only about having an idea but creating solutions that take those ideas into real life scenarios. Those ideas can become reality by transforming them into prototypes that represent solutions for complex problems. The established standards that support this strand are related to the usage of innovation kits and robotics, for the achievement of physical computing skills.

Figure 19. Axis 3 – Strand 2



(Note: Original creation)

5. Axis 4 – Online and community.

Communication with peers has always been a human need since the beginning of times, working with others is fundamental if we aim to achieve a better goal and achieve in a faster manner. In contrast to the past, interaction does not need to take place in person, but can in digital environments through social media apps and online tools. These tools have become a key part on online collaboration and communication.

The web can be a dangerous place to surf, since its population is composed by all types of users, such as digital natives and digital migrants, who make an online community.

Global citizens know the web essentials, where and how to interact, how to maintain their privacy and use online tools appropriately to manage their digital footprint in an efficient way.

The following images correspond to Axis 4 and its 4 strands: web essentials, communication & collaboration, privacy & security and digital portfolios.

Figure 20. Online and community axis

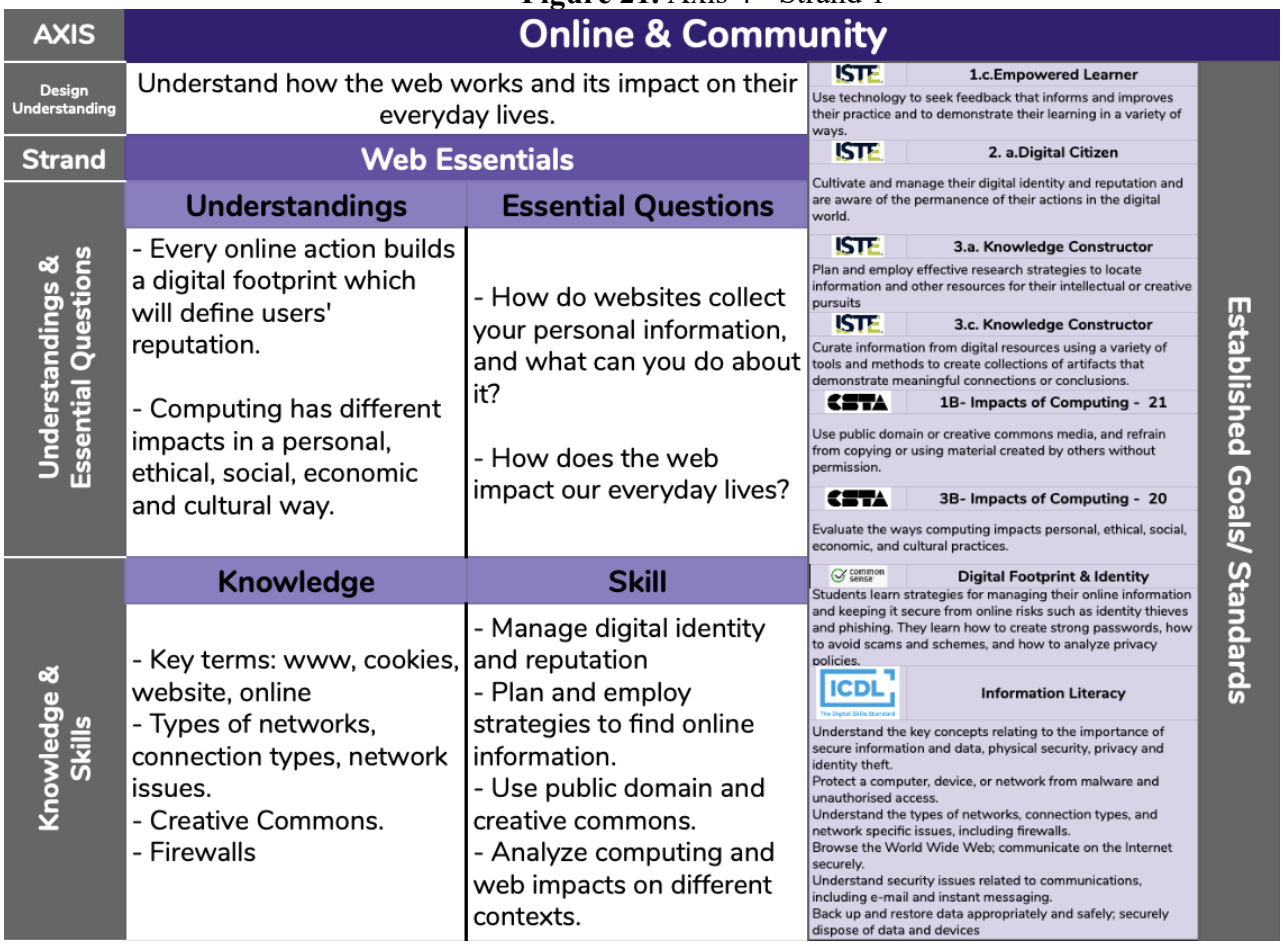
AXIS	Online & Community			
Design Standard/ Understanding	Understand how the web works and its impact on their everyday lives.	Understand digital technologies input on the development of positive communication and collaboration interactions.	Understand that living in an interconnected world has benefits and implications, the most effective way to embrace them is acting in a way that is safe, legal and ethical.	Understand the importance of self-reflecting before, during and after self - revealing.
Strand	Web Essentials	Communication & Collaboration	Privacy & Security	Digital Portfolios

(Note: Original creation)

a. Strand 1 – Web essentials

The world wide web can be a dangerous place. In order to be safe on it and to get the most from it, students need to understand how the web works and its social, ethical, economic and cultural impact. This strand focuses on the understanding of the web plus the building and management of an online reputation. The established goals that sustain this strand are related to the web's usage and management of online information.

Figure 21. Axis 4 - Strand 1

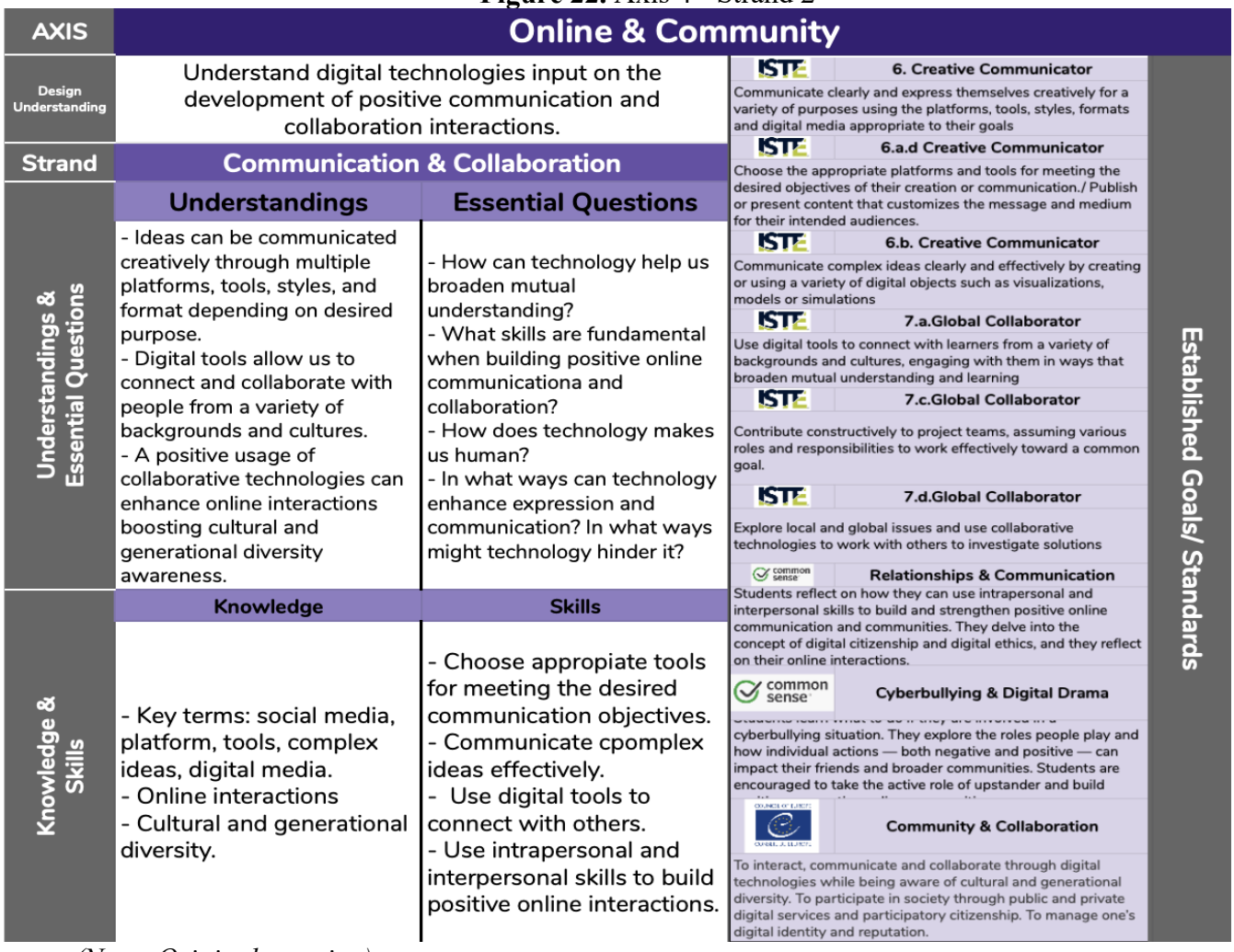


(Note: Original creation)

b. Strand 2 – Communication and collaboration

The impact and value of information is not only determined by the quality of it but by the channel where it is shared. Digital media is interactive, which means that its tools allow individuals to communicate and collaborate in different settings and for diverse outcomes. This strand aim is for students to understand how and when to use digital technologies to interact, communicate and collaborate with others. The established goals that relate to this strand contain terms referring to contribution, collaboration and communication.

Figure 22. Axis 4 - Strand 2

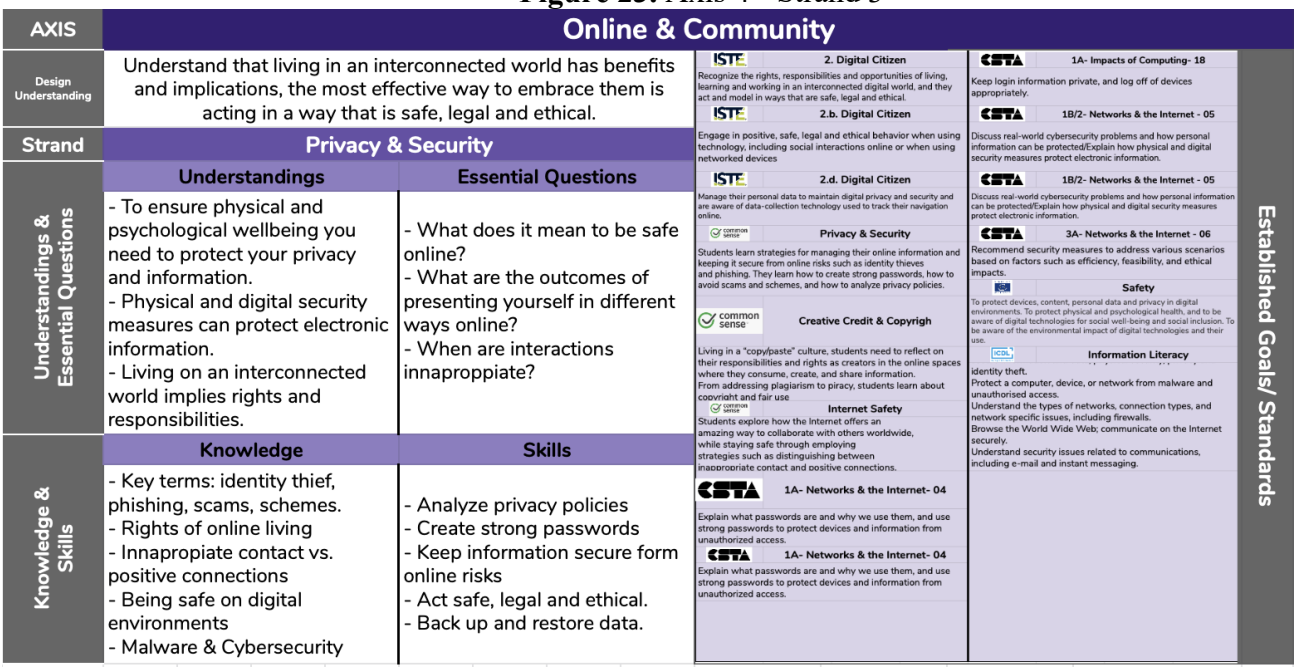


(Note: Original creation)

c. Strand 3 – Privacy and security

Students live in a rapidly changing and interconnected world, complete with its benefits and implications. This strand aims for students to understand how interacting online can be an exciting but risky experience where physical and digital measures can be taken in order to stay safe. The standards that substantiate this strand, are related to online safety, digital identity and security.

Figure 23. Axis 4 - Strand 3

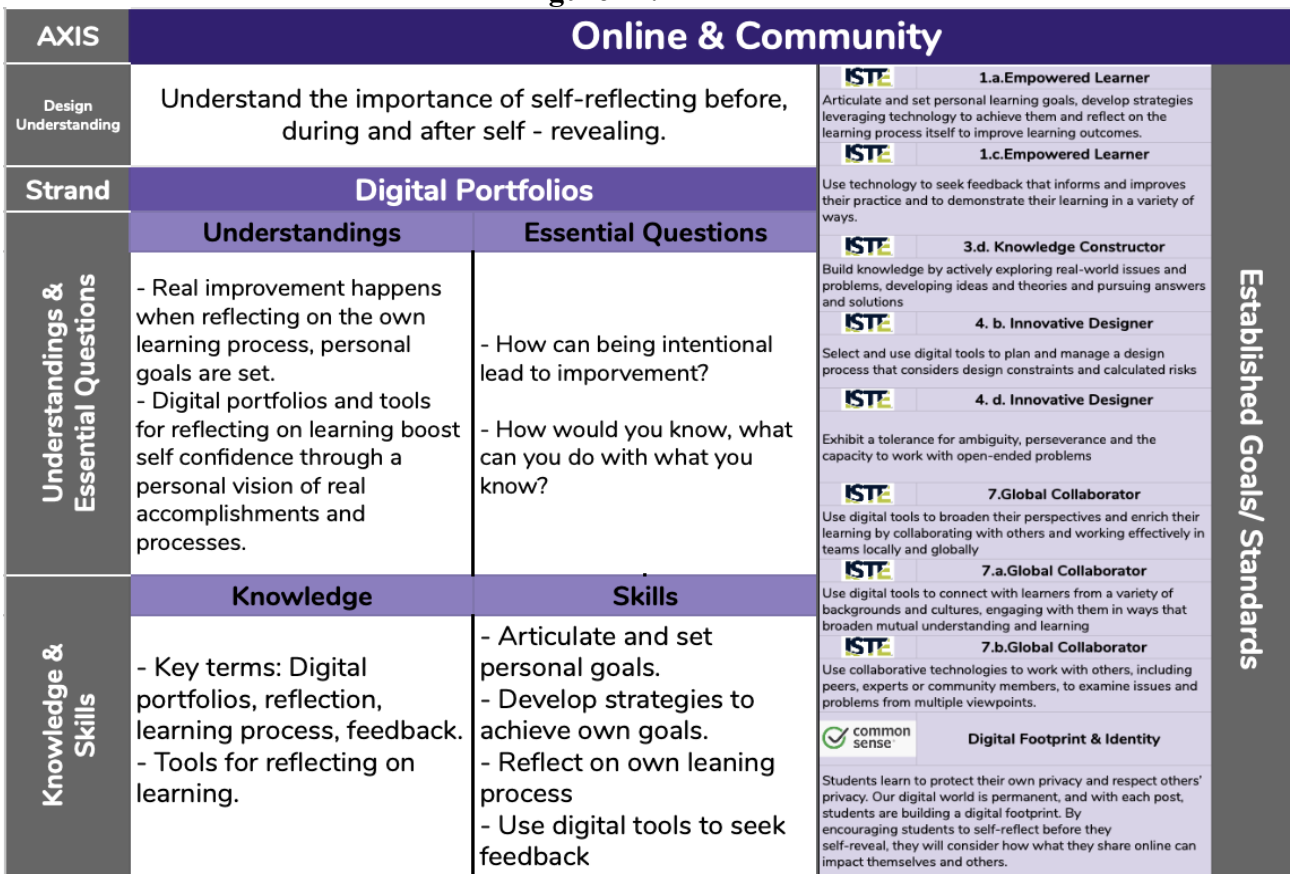


(Note: Original creation)

d. Strand 4 – Digital portfolios

Technology is useful to learn, to demonstrate learning, innovate and reflect on learning. The reflection process allows students to keep track of their learning, compare their results and have a better understanding of their own learning process. Digital tools can ease that reflection process, benefiting students in their learning path. This strand established goals relate to the use of technology in the learning process for students to be able to self-reflect, before they self-reveal.

Figure 24. Axis 4 - Strand 4

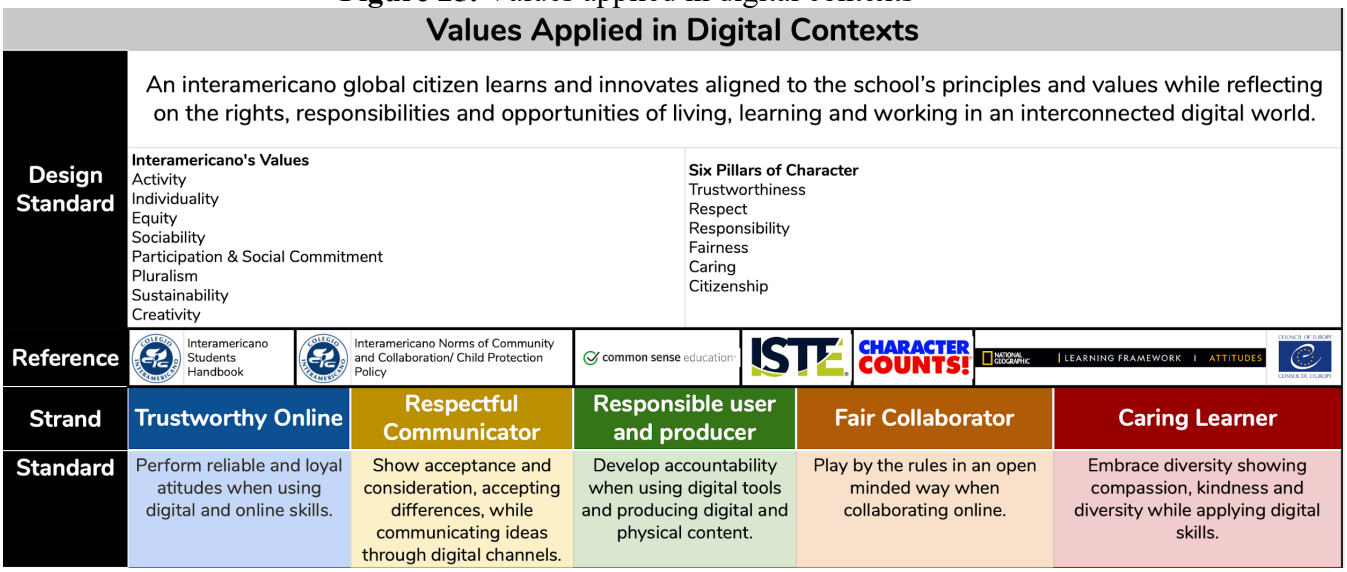


(Note: Original creation)

6. Values applied in digital contexts.

Colegio Interamericano's values framework is based in the six pillars of character, by Character Counts (Colegio Interamericano, 2019). In an interconnected world, each of the values in this framework has implications when applied on digital contexts. The following chart presents how each pillar would look like if applied in digital contexts. These digital context pillars can be integrated into the digital skills framework.

Figure 25. Values applied in digital contexts



(Note: Original creation)

C. Specific objective 3

Validate the proposal's standard-based teaching and learning approach.

1. Proposal design validation focus group

The focus group was a meeting in which participants were exposed to an experience with the proposal design and talked in depth conversation among them in a relaxed environment under the guidance of the researcher. The group was divided into roles (Administrator, Principal, Teacher, Student) and each subgroup was assigned one axis of the curriculum proposal design. Meetings and Interview transcripts. (appendix)

The participants went over the design of their axis and talked about their impressions with the rest of the group. Beyond asking the same question to several participants, each role was given a number of questions to be answered on a poster paper. The word transcription of the posters can be found on the appendix section of this document. Meetings and Interview transcripts. (appendix)

2. After proposal design meeting with IT leader.

The Colegio Interamericano IT leader was unable to attend the validation meeting focus group and requested a follow-up meeting with the researcher. The curriculum proposal design was shared with the IT leader two days before the meeting. During the meeting, a semi-structured interview was conducted, with the questions for Administrators from the focus group. The transcript of this meeting can be found in the appendix section of this document.

Subsequent to the proposal design, a validation meeting was arranged, in the style of a participative focus group, where Colegio Interamericano stakeholders' representatives interacted

with the curriculum and discussed if it was responsive to the school's mission and vision. There was an added meeting with the IT leader, since he could not attend the validation focus group.

Compiled data from the focus groups and interviews were transcribed and analyzed in ATLAS.ti, a qualitative analysis software that allows the user to create codes to classify the discourse and discover trends. These categories where created from the analysis of the transcription of the validation notes in the context of the frequency of occurrence of words.

The seventeen identified categories from the transcripts, and their appearance frequency is shown in the following table.

Table 6. Word Frequency by Code in ATLAS.ti

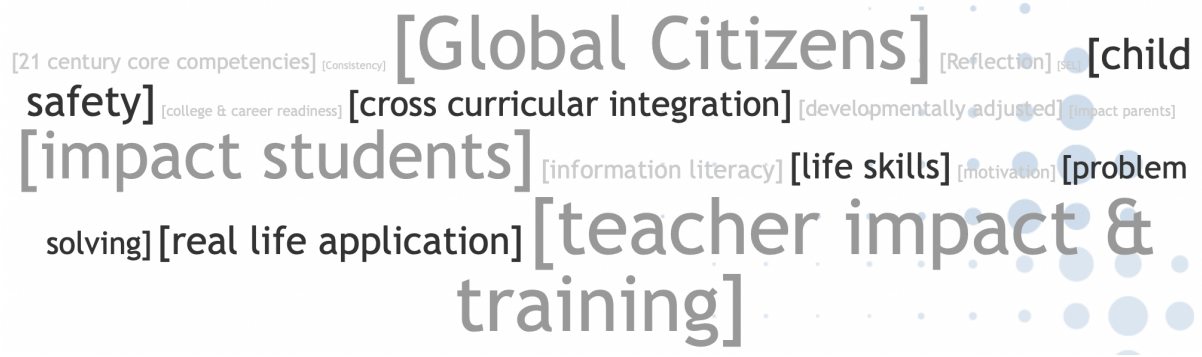
Code/Category	Frequency
21 Century Core Competencies	4
Child Safety	10
College and Career Readiness	2
Consistency	1
Cross Curricular Integration	8
Developmentally Adjusted	4
Global Citizens	19
Impact Parents	2
Impact Students	17
Information Literacy	5
Life Skills	8
Motivation	3

Problem Solving	7
Real Life Application	9
Reflection	4
SEL	1
Teacher Impact and training	20

(Note: Original creation)

After the encoding and classifying, a word cloud was generated, whose word size changes, according to the frequency of the words on the transcription.

Figure 26. Word cloud by author using ATLAS.ti



(Note: Original creation)

The information on the previous image and table illustrates the ways in which written and oral feedback, that was shared during the validation meeting and the IT interview, indicates the needs and interests of the participants, according to their role and division.

The biggest words (the ones with the most frequency) are: Teacher impact and training, global citizens and impact student, followed by child safety, real-life applications and cross-curricular connections.

This means that Interamericano stakeholders identified that the curriculum proposal design impacts teachers and students in a proportional way, by providing them with digital skill development as tools to become global citizens as they safely apply those skills in real life experiences, in different school subjects besides technology class. As Student 3 expressed:

> *"Learning this would excite me because it would help me learn how to solve problems in real life using technology. By learning this I could program almost anything I want, and it would also help me with problems. It would give me a better chance to go to a good university and get a good job. "*

It is important to recall, as well, that the impact that the design has for teachers is related to the professional development opportunities that it represents to them, in order to become digitally proficient above student level. When teacher training occurs, opportunities for cross-curricular connections arise. As Teacher 1 said.

> *"I envision myself teaching research and information literacy by using the main standards in a general theme, integrating myself or technology elective with other subjects coordinating with other teachers at what point can we take the time to prepare a final digital product to be presented and published to different audiences."*

Finally, the information obtained from the compilation methods, confirms the school's mission to prepare global citizens is supported by providing them the learning experiences that will allow them to become digital proficient in a rapidly changing world.

VI. Conclusions

- Colegio Interamericano's technology curriculum focus is preparing students with the skills needed in order to succeed in a world that changes in a rapid manner. To comply with this endeavor, the curriculum framework design is composed of overarching understandings, essential questions, skills, knowledge and values applied in digital contexts that respond to the established needs, stated by the international standards for technology in education.

- The 21st century digital skills, knowledge and values that respond to Colegio Interamericano's mission and vision are stated by the international Technology in Education representatives: the International Society for Technology in Education (ISTE), Computer Science Teachers Association (CSTA), International Computer Driver License (ICDL), European Commission Digital Competence Framework, Common Sense Education, the Raspberry Pi Foundation Curriculum, Common Sense Education, Google for Education, European Commission Digital Competence Framework for Citizens, Six Pillars of Character and the National Geographic Learning Framework/ Attitudes.

- The Digital Skills and Values Applied in Digital Contexts curricular framework is versatile since it is aligned with international digital proficiency standards along with the Interamericano mission and vision. The curriculum framework responds to a Backwards Design approach and it is sustained by the Standard-based and Competencies curriculum model.

- In order to successfully validate a curricular framework, it has a significant importance to take in account the main stakeholders, promoting a co-creation environment where the community needs satisfaction is ensured, easing the curriculum posterior implementation.

VII. Recommendations

- All three, the profile of an international student, the validation results, and the design based on standards and competences, point towards the impact of the Digital Skills and Applied Values in a Digital Context curriculum framework, and goes far beyond the technology class to the other subject areas involved in the students formation. It is recommended to develop a teacher's digital proficiency learning plan, "regardless of their subject and grade level" so teachers will successfully implement digital integration while helping students reach the four levels of understanding: learn, demonstrate, innovate and reflect on their learning.

- Backwards Design approach consists of curriculum development in three stages: Understandings and big ideas, assessment evidence and learning experiences. Digital Skills and Applied Values in a Digital Context curriculum framework is the Stage 1 towards creating a digital proficiency curriculum for the school. In order to fully implement the designed curriculum framework proposal, Digital Skills and Values Applied in Digital Contexts in Stage 2, is recommended to promote the creation of a collaborative team that includes all divisions stakeholders and technology teachers to develop the learning outcomes and assessment evidences by grade level and developmental stages. Consequently, for Stage Three, there is also the need to create a manual to help teachers craft learning experiences for students needs according to their grade and established instructional time, as well as guidelines to assess the implementation process.

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IX. Appendix

Appendix 1. Principals interview structure

Applied Digital Skills and Values
-Curriculum proposal design-
Principals Interview

As the Technology Middle School teacher and part of the educational technologies integration team, I strive to provide students aid and tools to develop the skills they need to succeed in the 21st century. In order to accomplish this endeavor, I decided to focus my master's graduation project on the design of a learning framework that complies with the International Society for Technology in Education (ISTE) standards, while aligning with Colegio Interamericano de Guatemala vision, mission, and values.

Essential Question:

- **What should be the Technology curriculum focus, in order to be responsive to the institution's mission and vision?**

Questions:

- **SECTION 1 - Current curriculum**
    1. Which is the role of Technology class in your division?
    2. What are some strengths of the current technology curriculum?
    3. What are some weaknesses of the current technology curriculum?
- **SECTION 2 - Division Needs**
    1. What are (your division) students' needs in terms of Digital Skills?
    2. What are (your division) students' needs in terms of Digital Knowledge?
    3. What are (your division) students' needs in terms of Digital Values?
    4. What do (your division) teachers' need students to know in terms of Digital Knowledge, Skills and Values?
- **SECTION 3 - Proposal**
    1. What are your expectations (for your division) of this new proposal design?
    2. Do you have any questions or comments about the project?

Appendix 2. General director proposal

APPLIED DIGITAL SKILLS & DIGITAL VALUES CURRICULUM PROPOSAL DESIGN

- **Curriculum Design Framework -**
  Guatemala, February 2019

I. Topic characteristics

Colegio Interamericano de Guatemala is an accredited international school whose primary concern, as established by the schools' mission, is to prepare global citizens with the knowledge, skills, and values to lead and improve a rapidly changing world. However, the current curriculum design for the Technology class consists of a list of software programs paired with standards that do not comply with students needs and schools' expectations.

The main question that will conduct this research is: **What should be the Technology curriculum focus, in order to be responsive to the institution's mission and vision?**

As the Technology Middle School teacher and part of the educational technology integration team, I strive to provide students aid and tools to develop the skills they need to succeed in the 21st century. In order to accomplish this endeavor, I decided to focus this graduation project on the design of a learning framework that complies with the International Society for Technology in Education (ISTE) standards, while aligning with Colegio Interamericano de Guatemala vision, mission, and values.

II. Objectives

A. Main objective

- Design a PS-12 curriculum proposal on Applied Digital Skills and Values, responsive to Colegio Interamericano's mission, vision and values.

B. Specific objectives

- Compile and arrange the 21st-century digital skills, knowledge, and values with a prioritized order according to the school demands and students needs, together with the reviewed literature.
- Validate standard-based and understanding by design, teaching and learning approaches.
- Develop a versatile learning framework from Preschool to Grade 12 aligned with ISTE standards along with Interamericano's mission and vision.

III. Literature review - outline

A. Technology in education

B. Connectivism
C. Curriculum
    a. Curriculum components
    b. Curriculum spiral design
D. Digital tools
E. Digital skills
F. Digital values
G. Previous curriculum designs
    a. Digital skills
        i. ISTE Standards for students
        ii. Common Sense Media curriculum
        iii. Applied digital skills from Google
    b. Values
        i. Six pillars of character initiative
    c. Digital Values
        i. Digital citizenship - Common Sense Media
    d. Standards
        i. GOLD Standards (Early Childhood Education)
        ii. Common Core Standards K-5(English Language Arts/ Mathematics)
        iii. Aero Standards (Social Studies)
        iv. Currículo Nacional Base (K-12 español)
        v. Next Generation Standards (Science)
    e. Computer Science and Data Science
        i. Codecademy
        ii. Khan Academy
        iii. Code HS
        iv. Code org
    f. National Geographic learning framework

IV. Action plan

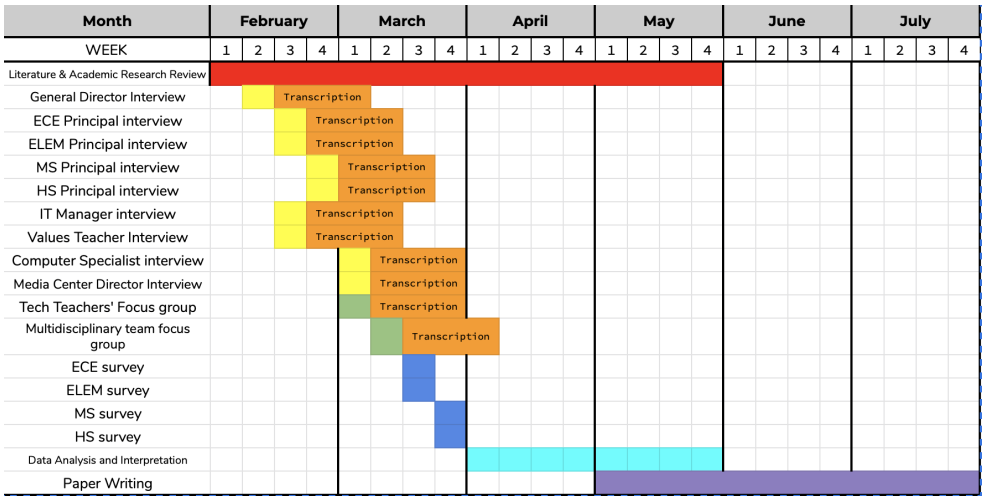
Type of study

The methodological approach taken in this study is qualitative research that will allow the exploration of the needs and demands together with the current related designs, all this coupled with the viewpoint of experts from different fields. Finally, this study will take into account students' opinions, parents and administrators wishes.

Data sources

Information compilation will be through different types of instruments, such as surveys, interviews, focus groups and narratives from experts, administrators, teachers, and students Academic research along with current curriculum designs will also be revised as part of the process.

V. Research Plan - Timetable



Appendix 3. Validation meeting notes

L= Leader Hat	**S= Student Hat**
How does this impact Inter's community? How can I support implementation?	Does learning this excites me? What will I be able to do if I understand this?
T= Teacher Hat	**P= Principal Hat**
How do I envision myself teaching this? Is it easy to understand?	How does this serve my division needs? What will it take to put this in action?

L1
Research and information literacy has a great wealth of potential to impact our Inter students and teachers an areas such as Understanding Perspective displayed on the internet for a child safety as well as fact versus fiction.
Also, teaching research skills as life skills and boost college & career readiness.

S1
Learning this kind of excites me.
If I understand and know this I could use this in order to help me in research in classes and in real life.
It would help me get more information easily.

T1
I envision myself teaching research and information literacy by using the main standards in a general theme, integrating myself or technology elective with other subjects coordinating with other teachers at what point can we take the time to prepare a final digital product to be presented and published to different audiences.
Yes its easy to understand well organized and set in the axis.

P1
Hitting 21 century core competencies
Creative thinkers, problem solvers, communicators.
Digital citizenship and understanding information means how to use responsibly and be aware of its impact is literacy
THE BIG HACK
HOW?! Tech is integrated across subjects and not stand alone
Redefine for students, teachers, parents, literacy.

L2
As a school we need to give our students the ethical and legal background to use the tools of the future and stay safe.
Communication & community = mutual understanding
It is designed to ensure it is consistently implemented 1 - 12
Work with students who become students who will self reflect before they self reveal.
Safety

S1
Learning this is very important, it is what keeps us safe and out of any legal or unsafe problem It does excite me because of the fact I am learning to be safe in the internet.
It may nave many rules and take responsibility but it is very useful.
If I understand this I could have the benefit of never having any online problem.

T2
It is a definitely important skill.
I do see myself teaching it (as I'm already doing it) although.
Of course it (the context) needs to be appropriate for early learners.
Most of this concepts will be taught later in Elementary -12
It's easy to understand while you are already in the field, as our teachers already are.

P2
How is it tied to SEL?
How do we adjust for ECE to make sure it is developmentally appropriate?
What does reflection looks like for ECE?
What do parents need to know?
What do we need their help with?

S3
Learning this would excite me because it would help me learn how to solve problems in real life using technology.
By learning this I could program almost anything I want, and it would also help me with problems.
It would give me a better chance to go to a good university and get a good job.

T3
At first very difficult to understand how someone would go about teaching this Computational Thinking standards.
Easier when I start from the bottom up. By the knowledge, skills, essential questions
Could use a big picture , purpose, real life examples.

P3
Using digital tools to solve problems, demonstrate understanding.
Reflective proceses by measuring quality and reliability.
Need to explore intentionality
Teachers NEED training
Cross curricular opportunities
Skills: understanding instructions, sequencing, problems into parts.

Appendix 4. IT Manager interview design

Interview with Interamericano's Technology Systems leader
Main Questions:

- How does this impact Inter's community?
- How can I support implementation?

Duration: 41 minutes
Location: IT manager office at Colegio Interamericano de Guatemala

Appendix 5. Validation meeting - Student invitation email to parents

Dear Parents of S[redacted]

I hope this email finds you well.

I am currently studying a Master degree in Educational Technology and Curriculum Development. Part of my dissertation was the design of a **Digital Skills and Values Framework** for Colegio Interamericano's Technology course.

After a rewarding learning process of interviewing, bibliography reference and design, I have the pleasure to invite Sarah to the curriculum validation meeting with the main community stakeholders to review the framework design. Those members are all division principals, technology teachers, leadership team and exemplary student leaders as S[redacted]

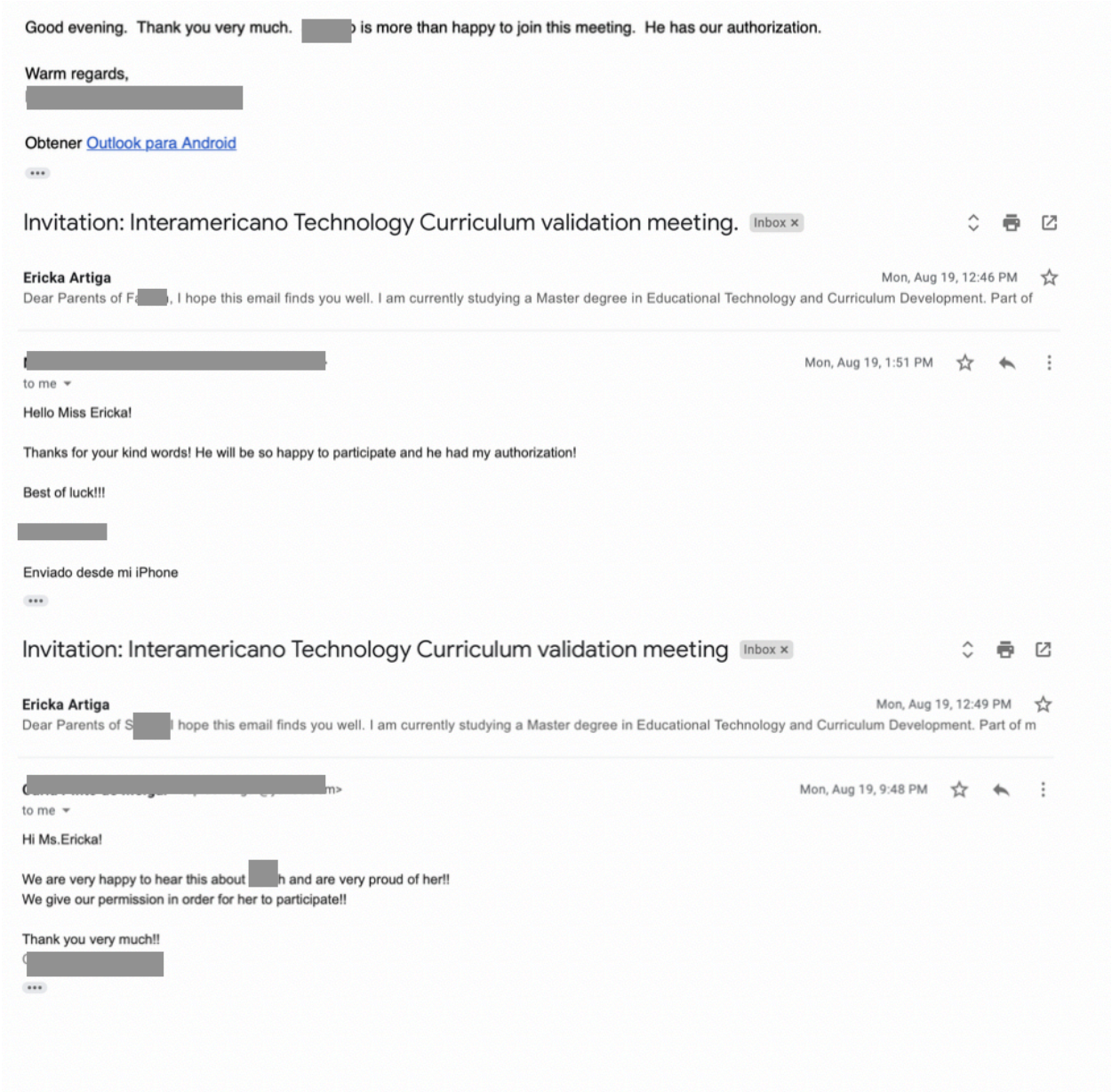
The meeting will consist of reviewing the technology curriculum design, for what Sarah's input will be very appreciated since he is one of the most remarkable students in the technology field at school. No personal information about Sarah will be shared.

This meeting will be held in the conference room in the administration building tomorrow at 9:00 am. In order for her to attend, we need you to authorize his participation replying to this email.

It will be a pleasure to count with her that day.

Kind regards,

Appendix 6. Interamericano students - written authorizations



Good evening. Thank you very much. [redacted] is more than happy to join this meeting. He has our authorization.

Warm regards,
[redacted]

Obtener Outlook para Android

Invitation: Interamericano Technology Curriculum validation meeting. Inbox ×

Ericka Artiga Mon, Aug 19, 12:46 PM
Dear Parents of F[redacted], I hope this email finds you well. I am currently studying a Master degree in Educational Technology and Curriculum Development. Part of

[redacted] Mon, Aug 19, 1:51 PM
to me

Hello Miss Ericka!

Thanks for your kind words! He will be so happy to participate and he had my authorization!

Best of luck!!!

[redacted]

Enviado desde mi iPhone

Invitation: Interamericano Technology Curriculum validation meeting Inbox ×

Ericka Artiga Mon, Aug 19, 12:49 PM
Dear Parents of S[redacted] hope this email finds you well. I am currently studying a Master degree in Educational Technology and Curriculum Development. Part of m

[redacted] Mon, Aug 19, 9:48 PM
to me

Hi Ms.Ericka!

We are very happy to hear this about [redacted]h and are very proud of her!!
We give our permission in order for her to participate!!

Thank you very much!!
[redacted]