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Digital Competencies in Formal and Hidden Curriculum

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Background purpose: Research on digital competence has been one of the most important policy goals in the area of education in the European Union for almost two decades. In 2017, two essential documents were published: DigComp 2.1 - The Digital Competence Framework for Citizens with eight proficiency levels (Carretero et al., 2017) and examples of use and the European Framework for the Digital Competence of Educators – DigCompEdu (Redecker, 2017). Despite these documents and all the research in the field of digital competencies, there is still no unified instrument for measuring the digital competencies of citizens. The problem is that digital competencies encompass a wide range of skills, from basic digital literacy to advanced technical proficiency, and they evolve with technological advancements. Researchers and policymakers face several obstacles in creating a one-size-fits-all tool for assessing these competencies. This paper expands existing research in the field of digital competence in formal education in Slovenia. Our research aimed to explore curricular aspects of acquiring digital competencies within the three levels of formal education and the level of achieving digital competencies among citizens (students) in Slovenia. The purpose of our study was to gain a broader understanding of how participants in formal education obtain digital competencies to obtain a publicly recognized qualification within the education system in Slovenia.
Design/Methodology/Approach: To examine the field of digital competence in formal and hidden curricula, we first survey students (citizens) to assess their self-perception regarding digital competencies. Then, we interviewed teachers from various faculties to identify elements of the hidden curriculum. Finally, we reviewed publicly available educational content regarding acquiring digital competencies in primary and secondary schools and universities.
Results: The extent of formal teaching of content related to digital competencies within the public education system in Slovenia is small. During the average duration of formal education, a Slovenian citizen listens to approximately 2,000 hours of mathematics lessons, around 1,000 hours of art lessons, and 200 hours of computer science and informatics lessons. The research results have shown that, even in subjects unrelated to computer science, informatics, and digital competencies, students acquire digital competencies as part of the hidden curriculum at universities. The arithmetic mean among students' (citizens') research of other competencies indicates that respondents can operate independently. The results of the level of digital competencies according to DigiComp 2.1. show that, except for two competencies; all are within are within level 5. This means that the self-assessed level of digital competencies among students (citizens) has mostly stopped at tasks they perform for their own needs.
Conclusion: In the future, EU countries will need to standardize the assessment system for digital competencies to determine the level of individuals' digital competencies. The school system in Slovenia will have to introduce a significant amount of computer science knowledge into the curricula of subjects, with particular attention given to upgrading digital competencies within hidden curricula.

Keywords: *Formal curriculum, Hidden curriculum, Digital competence, DigiComp 2.1*

1 Theoretical perspectives

In the article, we address the curricular aspects of acquiring digital skills within the framework of three levels of formal education and the attainment of digital competencies by citizens (students) in Slovenia.

Digital competencies have been one of the most important policy goals in the European Union education area for

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almost two decades, at least at the declarative level.

On 26 February 2021, the European Union Council published a document. »Resolution on a strategic framework for European cooperation in education and training towards the European Education Area and beyond (2021-2030) «[1]

Through this political document, the European Commission, acting as the executive body, published a document called »The European Education Area Strategic Framework. «[2]. This document outlines seven vital operational objectives, all of which are measurable. One of these objectives is that by 2030, less than 15% of eighth graders should have needed computer and information literacy results.

In recent years, citizens' digital competencies have become one of the more critical areas of operation in the European Union's policies, education, and various social subsystems. It is important to note that the documents mentioned from 2021 are only some of the first documents of the European Union related to the areas described by the keywords computing, informatics, digitalization, and digital competencies.

The European Parliament had already, in December 2006[3] adopted recommendations on lifelong learning. Building upon this, the European Commission addressed digital competencies in 2007 in the document "Key Competencies for Lifelong Learning, European Reference Framework." In this document, the European Commission established eight key operational objectives for lifelong learning, with the attainment of digital competencies listed as the fourth among the eight objectives for lifelong learning.

In 2009, the European Commission adopted Education and Training 2020. This document outlined four key strategic objectives for the education system in EU member states. While digitization was not explicitly listed as one of the key objectives, it was mentioned several times in the document.

In 2017, two essential documents were published:

- "DigComp 2.1: The Digital Competence Framework for Citizens with eight proficiency levels and examples of use"(Carretero et al., 2017) and
- "European Framework for the Digital Competence of Educators: DigCompEdu" (Redecker, 2017).

The document DigComp 2.1 (Carretero et al., 2017) defines and describes key areas of digital competencies for citizens. It serves as a tool at the EU level to enhance the digital skills of citizens, assist policymakers in shaping policies supporting the strengthening of digital skills, and plan initiatives for education and training to improve digital competence.

On the other hand, the DigCompEdu (Redecker, 2017) document presents and describes digital competencies tailored explicitly for educators. It proposes 22 foundational competencies organized into six areas. The framework also includes a progression model to help educators assess and develop their digital competencies.

On 22 May 2018, the Council of the European Union adopted recommendations regarding key competencies for lifelong learning[4]. In this document, all member states of the European Union pledged in writing, among other commitments, to "…increase and improve the level of digital competencies at all stages of education and training across all segments of the population."

Digital competencies are not only a politically relevant topic but also the subject of serious academic research. The digital competencies of individuals, whether they are students or the working population, have likely been the subject of study since the advent of computers. The fundamental method of studying digital competencies has been and continues to be self-assessment. Various questionnaires were developed before 2017. However, these questionnaires have also faced criticism. Ballantine et al. (2007) evaluated the reliability of self-assessment as a measure of computer literacy. The results reveal the surveyed students' statistically significant overestimation of computer competencies.

Although self-assessment is not the most reliable indicator of actual competency levels, both 2017 questionnaires - DigCompEdu (Redecker, 2017) and DigComp 2.1 (Carretero et al., 2017) « are based on self-assessment.

After 2017, the exploration of the levels of digital competencies has once again become more prominent. Digital competencies are once again the subject of numerous academic research endeavours. Within the broader context of the study, the digital competencies of primary and secondary school students, faculty students, and learners are mainly focused on research subjects.

Godaert et al. (2022) conducted a systematic review of empirical research on assessing the digital competencies of primary school students. They based their study on the European framework of digital competencies. The results showed that most previous studies originated from a different conceptual framework of digital competencies. Previous studies assessed digital competencies as "information and data literacy," "communication and collaboration," and "creating digital content." Less attention was given to assessing competencies in "safe and responsible use" and "problem-solving."

[1] Publication Office of the European Union (2021)
[2] European Commission, European Education Area (2021)
[3] Official Journal of the European Union (2006)
[4] Official Journal of the European Union (2018)

Martzoukou et al. (2020) conducted a study on a sample of library and information science students from three higher education institutions in Scotland, Ireland, and Greece. The survey focused on students' technical and higher-order digital competencies. Self-assessment of students' digital competencies revealed a deficient level of achieved competencies in various areas, including the development of information literacy, digital creation, digital research, and management of digital identity.

1.1 The concept of competencies and digital competencies

Competencies are a relatively old concept that has long been defined and supported by scientific research. Over the decades, numerous definitions of competence content and models for measuring competence levels have evolved. Due to the breadth of this field, we will only have a short review of academic literature. However, we will summarize how major international organisations conceptualize competencies.

The OECD (2005) defines competence in the document "Definition and Selection of Competencies." According to the OECD, competence is more than just knowledge and skills. It involves the ability of an individual to face complex situations by using and mobilizing psychosocial resources (including skills and attitudes) in a specific context. For example, the ability to communicate effectively is a competence based on an individual's language knowledge, practical skills in information technology, and attitude toward the people they are communicating with.

In the document "Key competencies for lifelong learning, European reference framework", the European Union defined and recognized eight essential competencies for lifelong learning. These competencies include: 1. communication in the mother tongue, 2. communication in foreign languages, 3. mathematical competence and basic competencies in science and technology, 4. digital competence, 5. learning to learn, 6. social and civic competencies, 7. sense of initiative and entrepreneurship, 8. cultural awareness and expression.

Unlike competencies, digital competencies are. Various understandings and models for measuring levels have evolved between the end of the 20th and the beginning of the 21st century. Ilomäki al. (2011) published a review of existing conceptualizations.

In our research, we used the DigiComp 2.1 model (Redecker, 2017). This model comprises 21 competence items categorized into five content areas:

Information and data literacy
- Browsing the web, searching, and filtering data, information, and digital content
- Evaluating data, information, and digital content
- Managing data, information, and digital content

Communication and Collaboration
- Interaction through digital technologies
- Sharing through digital technologies
- Engaging in citizenship through digital technologies
- Collaborating through digital technologies
- Netiquette
- Managing digital identity

Digital content creation
- Developing digital content
- Integrating and re-elaborating digital content
- Copyright and licenses
- Programming

Safety
- Device protection
- Protecting personal data and privacy
- Protecting health and well-being
- Protecting the environment

Problem-solving
- Solving technical problems
- Identifying needs and technological responses
- Creatively use of digital technologies
- Identifying digital competence gaps

DigiComp 2.1 recognizes eight levels of achieving competencies. The levels are defined by the complexity of the task and the independence with which someone performs that task.

1.2 Curriculum

We are practically all involved in the education system: either as participants in education, as education providers, as parents, or as employers. In various contexts, the term "curriculum" is often encountered. Some may also use the word "curricula." The word "curriculum" has Latin origins and means course or path. The word "curricula" is not found in the Latin-Slovenian dictionary. In the 16th and 17th centuries, "curriculum" meant a sequence of learning over the years. The word "curricula" is said to have originated in the 18th century and most often refers to the course of work in school (Ferjan, 2005).

Today, there are dozens, perhaps even hundreds, of definitions for the term "curriculum." What they all have in common is that the curriculum has, for centuries, meant something related to education.

Posner (2004) also answers the question of why there are so many definitions of the term "curriculum." The differences in understanding and definitions stem from the fact that the curriculum in schools (nowhere in the world, it seems) is not ideologically and politically neutral.

Many authors in the literature still treat the curriculum merely as a selection of learning materials, even though as early as 1949, Ralf W. Tyler (1949) defined the curriculum much more broadly, including methods of education and evaluation as part of the curriculum.

Table 1: Levels of achieving competencies according to DigiComp 2.1 (Redecker, 2017)

LEVEL	COMPLEXITY OF TASKS	AUTONOMY
1	Simple tasks	With guidance
2	Simple tasks	Autonomy and guidance where needed
3	Well-defined and routine tasks and straightforward problems	On my own
4	Tasks and well-defined and non-routine problems	Independent and according to my needs
5	Different tasks and problems	Guiding others
6	Most appropriate tasks	Able to adapt to others in a complex context
7	Resolve complex problems with limited solutions	Integrate to contribute to the professional practice and guide others
8	Resolve complex problems with many interacting factors	Propose new ideas and processes to the field

Since the education system in Slovenia, like in most European countries, is fundamentally based on principles recognized by UNESCO, we will also base our work on curriculum definitions as understood by UNESCO. Arieh Lewy wrote the foundational theoretical works shaping UNESCO's understanding. Lewy (1977) conceptualizes the curriculum as a process that includes:

- Defining educational goals
- Selecting learning content
- Designing educational strategies
- Preparing educational materials
- Recruiting teachers
- Evaluation
- Implementation

The curriculum should not be understood merely as a "syllabus." The curriculum should always be treated as a whole of planning, implementation, and evaluation. Therefore, the curriculum means:

- Planning the process initially
- Implementing it by the plan
- Following the implementation with evaluation aimed at identifying opportunities for improvement.

Every education has a specific goal. Educational goals can be defined in various ways:

- These are the cognitive, educational, and educational field goals that we want to achieve.
- Describe specific educational goals using Bloom's taxonomy model (1969).
- By explicitly describing the competencies acquired by the participant in education and using one of the concrete competence models.

The selection of learning content must stem from the definition of educational goals.

The education strategy primarily involves methods; an active method implies that the goal will be achieved through the participant's activity, while a passive method means that the participant receives the experience from another. Each education requires material and personnel conditions. Evaluation is also part of the curriculum.

The curriculum must be formalized when dealing with curricula to obtain officially recognized education. This means that the content must include all the elements of the curriculum, and the process of preparation and approval must be formally defined. In practice, this means that educational programs are prepared according to the curriculum model as a whole and syllabi for individual subjects.

1.3 Digital curriculum

When we talk about the digital curriculum, it is about more than just educational content related to digital competencies; it is about materials for electronic education and, for example, distance learning using tools such as MS TEAMS, ZOOM, or others. Matos et al. (2019) understand the digital curriculum as integrating digital technology into all curriculum elements. Therefore, it involves incorporating digital content and digitizing all curriculum components.

However, we can understand the digital curriculum even more broadly. A suitable framework for a broader understanding of the digital curriculum is the European Framework for the Digital Competence of Educators: DigCompEdu (Redecker, 2017). The goal of the DigCompEdu framework (Redecker, 2017) is to present and describe digital competencies specific to educators. The framework proposes 22 core competencies categorized into six areas.

The European Framework for the Digital Competence of Educators, DigCompEdu (Redecker, 2017), classifies

teachers' competencies into six areas: professional engagement, digital resources, teaching and learning, assessment, empowering learners, and leading and supporting students in acquiring digital competencies. None of these can be argued to be unrelated to the digital curriculum.

1.4 The hidden curriculum

The hidden curriculum concept was first introduced in 1968 by researcher Phillip Jackson (1968) in his book "Life in Classroom." The hidden curriculum is what teachers unintentionally teach students through their interpersonal relationships, models, and the school or classroom culture without being consciously aware of it. It consists of unspoken values, beliefs, norms, and cultures.

The hidden curriculum has four key attributes:

- It needs to be formally documented.
- Nevertheless, it occurs or is implemented.
- If it involves educational content, the content is not necessarily linked to the formal curriculum.
- The consequences are "learning outcomes" for the participants in education.

The literature describes numerous examples of the hidden curriculum, many of which are also related to digital competencies.

In the context of our research, the study conducted by Tribukait and co-authors in 2017 is worth mentioning. This study investigates how modern European educational policies and curricula shape digital learning in schools, explicitly emphasizing history lessons. It focuses on teaching history, with students also acquiring digital competencies in the background (Tribukait et al., 2017). This research is also relevant to our context, as in our study, we have also explored digital competencies, but in the context of teaching social and business sciences.

Mertala (2020) used the "hidden curriculum" concept as a heuristic tool in his research to analyze everyday practices related to data in formal education. Based on a thorough reading of theoretical literature, he argues that everyday practices related to data in modern education can be considered functional forms of education for data literacy. Because functional data literacy education occurs subconsciously, it can be conceptualized as a form of hidden curriculum. This idea refers to lessons taught and learned but not consciously intended or documented in the formal curriculum.

2 Research Methodology

The purpose of our research was to gain a broader understanding of participants' acquisition of digital competencies in formal education to obtain a publicly recognized qualification within the education system in Slovenia. Our research aimed to gather data on the level of digital competencies among students and the existing methods of acquiring these competencies in the education system at all three levels. Therefore, we conducted:

- a survey among students to assess their self-perception regarding their digital competencies,
- a structural interview among teachers from various faculties to identify elements of the hidden curriculum and
- a review of publicly available educational content regarding acquiring digital competencies in primary and secondary schools and universities.

The entire research results will serve as a basis for planning and designing a new curriculum at the faculty within the framework of the pilot project BIONIKA (more information within aknowledgements).

The research questions were:

- What is the level of digital competence among students?
- To what extent are educational contents related to digital competence included in the formal curriculum at primary and secondary schools and universities?
- To what extent are contents related to digital competence included in the hidden curricula of universities?
- How much attention do universities give to the digitalization of the entire curriculum?

Digital competences of students at the faculty of organisational sciences

As our research was a pilot study, we examined the levels of digital competence among students only at one faculty, namely the Faculty of Organisational Sciences at the University of Maribor. The sample included 115 undergraduate study program students from the second and third years. The sample did not include computer science students but only students of Human Resource Management, a social science program. The self-assessment anonymous survey was conducted online using the 1KA platform in October 2023. The questionnaire included all 21 competency statements from the DigiComp 2.1 document. The scoring scale covered all eight levels of self-assessment. The formulations were verbatim from the Slovenian translation of the DigiComp 2.1 model.

Digital competencies in the formal curriculum at primary and secondary schools and universities

To determine the extent of learning content related to digital competencies in the formal curriculum at primary and secondary schools, we examined the curricula of primary schools and gymnasiums, which are publicly available on the websites of the Ministry of Education or the National Education Institut Slovenia. We were interested only in the extent of the content, and we did not examine the specific content of the curricula.

To determine the extent of learning content related to digital competencies in the formal university curriculum,

we examined the syllabi publicly available on the faculties' websites. We were specifically interested in the social sciences and business studies faculties. The situation might be different on technical faculties. We were interested only in the extent of the content, and we did not examine the specific content of the syllabi.

Digital competences in hidden curricula and the digitalization of university curricula

Since our research is pilot, it is focused only on social sciences and business faculties. The selected faculties in our study were:

- University of Ljubljana: Faculty of Economics, Faculty of Administration, Faculty of Social Sciences;
- University of Maribor: Faculty of Organisational Sciences, Faculty of Tourism, Faculty of Logistics, Faculty of Criminal Justice and Security, Faculty of Education;
- University of Primorska: Faculty of Management;
- Faculty of Applied Social Studies.
- From each faculty, we selected one professor. The criteria for selecting the sample were:
- the person must be the holder of subjects in the field of social sciences or business;
- the person must be a member of the senate of the selected faculty (as we also inquired about the frequency of discussions related to the digital curriculum in the professional bodies of the faculty - senate and department).

Characteristics of the sample based on gender: 5 males and 5 females. The sample included 8 full professors and 2 assistant professors. The average age of the respondents was 49 years. The oldest was 61 years old, a male with the title of full professor. The youngest was a 39-year-old female with the title of assistant professor. We ensured the anonymity of all participants as well as the anonymity of the institution. In October 2023, we conducted structured telephone interviews with ten professors from ten faculties.

To gather information about the inclusion of content related to digital competencies in the hidden curriculum, we used 21 statements of competence content from DigiComp 2.1. The formulations were verbatim from the Slovenian translation of the DigiComp 2.1 model. We inquired about how often these contents were included in the subject they last taught. The significance of the responses was as follows:

- 0 - this form of "digitalization" is not formalized or included in the curriculum and is not part of the subject.
- 1 - this form of "digitalization" is not formalized or included in the curriculum, but I include it indirectly in the subject ("hidden curriculum").
- 2 - this form of "digitalization" is formalized or included in the curriculum and is part of the subject.

Furthermore, we were interested in the digitization of the curriculum. To obtain data on the importance attributed to the digitization of the entire curriculum at the faculty, we asked one question for each of the curriculum items: defining educational goals, selecting teaching materials, devising education strategies, preparing education materials, acquiring teachers, evaluation, and implementation. We asked how often formal discussions about the digitization of the curriculum take place at the faculty senate and the departments. Table 2 shows the significance of the answers.

3 Research Results Digital Competence of Students

Arithmetic means and standard deviations of students' self-assessed digital competencies are presented in Table 3.

Most competencies are equal to level 3 and higher than level 5. The lowest level of competence is observed in the "programming" competence. The majority of them need help to program even simple things. However, almost everyone can solve other routine tasks and simple problems independently. Handling unconventional issues, except for programming, is manageable for most respondents, according to their needs. Providing support to others is an average ability among respondents, particularly in competencies related to online etiquette and communication using digital technologies. In contrast, for other competencies, it could be more pronounced.

Table 2: The significance of the answers

0	1	2	3	4	5	6
Never	Several times a year or less often	Once a month or less often	Several times a month	Once a week	Several times a week	Every day

Table 3: Descriptive Statistics of Students' Digital Competences According to DigiComp 2.1. (n= 115)

	COMPETENCE AREAS	MEAN	STD. DEV
	Information and data literacy		
1	Browsing the web, searching, and filtering data, information, and digital content	4,76	1,565
2	Evaluating data, information, and digital content	4,57	1,686
3	Managing data, information, and digital content	4,66	1,664
	Communication and collaboration		
4	Interaction through digital technologies	5,19	1,654
5	Sharing through digital technologies	4,90	1,698
6	Engaging in citizenship through digital technologies	4,09	1,814
7	Collaborating through digital technologies	4,83	1,738
8	Netiquette	5,29	1,746
9	Managing digital identity	4,90	1,722
	Digital content creation		
10	Developing digital content	3,91	1,927
11	Integrating and re-elaborating digital content	3,62	1,745
12	Copyright and licenses	3,59	1,752
12	Programming	2,81	2,047
	Safety		
14	Device protection	4,28	1,740
15	Protecting personal data and privacy	4,31	1,698
16	Protecting health and well-being	4,57	1,778
17	Protecting the environment	4,74	1,727
	Problem-solving		
18	Solving technical problems	3,84	1,852
19	Identifying needs and technological responses	4,02	1,706
20	Creatively use of digital technologies	3,95	1,751
21	Identifying digital competence gaps	3,69	1,815

Acquiring digital competences in primary and secondary school

Furthermore, we were interested in the extent to which schools provide students with digital competencies. The curricula of publicly recognized schools in Slovenia could be more extensive regarding digital content. This can be stated for all levels of education. An exception, of course, is those schools that educate for professions directly related to computing and informatics.

The curriculum of publicly recognized primary schools does not contain any content related to digital competencies at all. The primary school provides instruction in the following mandatory subjects for all students: Slovenian and Italian or Hungarian in ethnically mixed areas, a foreign language, history, society, geography, homeland and civic culture and ethics, mathematics, natural science, environmental studies, science and technology, chemistry, biology, physics, visual arts, music, physical education, technology, and home economics. The school also conducts special pedagogical activities in adapted educational programs with an equivalent educational standard.

The school must also provide elective subjects for 7th, 8th, and 9th grade students (third educational period). The school must offer at least three subjects from the social-humanistic and at least three from the natural science-technical group. Within the social-humanistic group, the school must offer instruction in a foreign language, non-denominational religious education, ethics, and rhetoric[5].

[5] Zavod Republike Slovenije za šolstvo (2023)

High school students receive more computer science and informatics content. All high schools of the same type in Slovenia have identical and standardized curricula. For example, let us look at the curricula of the educational programs for the General Gymnasium, Economic Gymnasium, and Technical Gymnasium[6].:

- the curriculum for the General Gymnasium includes the subject Informatics in the 1st year, with a scope of 70 hours
- the curriculum for the Economic Gymnasium includes the subject Informatics in the first and second years, both with a scope of 70 hours each
- the curriculum for Technical Gymnasium includes the subject of Informatics in the 1st year, with a scope of 105 hours.

The subject of our study in higher education was only faculties in the field of social and business sciences. We found that in study programs related to business sciences at these faculties, it is common to have a course in the first year of undergraduate studies that is thematically related to students' digital competencies. Here are a few examples of study programs from faculties in the field of business sciences:

- At the Faculty of Economics and Business, University of Maribor (2023), the university study program at the undergraduate level, 'Economic and Business Sciences,' includes the compulsory course 'Business Informatics' in the first year, with a scope of 5 ECTS[7];
- At the Faculty of Economics, University of Ljubljana (2023), the university study program at the undergraduate level, 'Business Economics,' includes the compulsory course 'Informatics' in the first year, with a scope of 6 ECTS[8];
- At the Faculty of Management, University of Primorska (2023), the university study program at the undergraduate level, 'Management,' includes the compulsory course 'Study and ICT Practicum' in the first year, with a scope of 3 ECTS[9].
- At the Faculty of Social Sciences, University of Ljubljana (2023), there is bachelor and master programm Social Informatics. We have also found that in social science study programs, it is not necessarily included in the curriculum to have a course that imparts digital competencies[10].

Digital competence in hidden curricula

Table 4 shows the frequency of teacher self-assessment regarding the incorporation of digital competencies into the curricula of their subjects.

The results indicate that a significant amount of content related to digital competencies is already formally prescribed in the curricula of subjects not directly related to computer science and informatics. The most common aspects include searching, retrieving, and selecting data, information, digital content, and communication using digital technologies.

As for the hidden curriculum, most mentioned aspects are data management, information, digital content, and digital identity management. Five out of ten respondents mentioned this competency. It is highly likely that students acquire this competency as a result of digitizing the entire curriculum, not just activities in a specific subject.

Based on the participants' responses, considerable attention is given to digitizing the entire curriculum at the faculties. Table 5 shows the frequency of professors' self-assessments regarding the frequency of addressing curriculum aspects of digitization in departments and the senate.

The results indicate that at faculties, the most frequently addressed aspects are the objectives of introducing digitalization into education, educational content related to digitalization, and the digitization of educational materials. On average, these aspects are addressed approximately once a month. Other aspects of curriculum digitization are addressed less frequently. The least frequently addressed aspect is the digitization of evaluations.

4 Discussion

According to World Bank (2020) data, the expected duration of education in Slovenia is 13.6 years, but when excluding repetitions and "gaps," the actual duration is 11.4 years. Our research focused on determining the average extent of formal education content related to digital competencies that a Slovenian citizen receives. First, we examined the primary school level. This period is crucial for acquiring knowledge, and at the same time, missed opportunities during this time can be challenging to make up for. The program that can be considered an international reference is PISA.

PISA is the OECD program for international student assessment. PISA measures the ability of 15-year-olds to apply their reading, mathematical, and scientific knowledge and skills to real-life challenges. Unfortunately, PISA does not directly assess digital competencies. In the PISA 2022 study, conducted from 26 July to 16 September 2022, 85 countries participated. Three key learning areas were evaluated: reading literacy, mathematics, and science. An innovative area, which changes from cycle to cycle, was

[6] Ministrstvo za šolstvo Republike Slovenije (2023)
[7] Ekonomsko poslovna fakulteta Univerze v Mariboru (2023)
[8] Ekonomska fakulteta Univerze v Ljubljani (2023)
[9] Fakulteta za management Univerze na Primosrskem (2023)
[10] Fakulteta za družbene vede Univerze v Ljubljani (2023)

Table 4: Frequencies of responses from surveyed professors on incorporating content into the subject (n=10)

	COMPETENCE AREAS	**0**	**1**	**2**
	Information and data literacy			
1	Browsing the web, searching, and filtering data, information, and digital content	0	3	7
2	Evaluating data, information, and digital content	3	3	4
3	Managing data, information, and digital content	1	6	3
	Communication and collaboration			
4	Interaction through digital technologies	0	3	7
5	Sharing through digital technologies	0	4	6
6	Engaging in citizenship through digital technologies	7	1	2
7	Collaborating through digital technologies	1	4	5
8	Netiquette	3	4	3
9	Managing digital identity	2	5	3
	Digital content creation			
10	Developing digital content	2	3	5
11	Integrating and re-elaborating digital content	3	3	4
12	Copyright and licenses	2	4	4
12	Programming	8	1	1
	Safety			
14	Device protection	5	3	2
15	Protecting personal data and privacy	2	5	3
16	Protecting health and well-being	5	3	2
17	Protecting the environment	6	1	3
	Problem-solving			
18	Solving technical problems	8	0	2
19	Identifying needs and technological responses	6	2	2
20	Creatively use of digital technologies	4	3	3
21	Identifying digital competence gaps	6	4	0

Table 5: Frequencies of responses from surveyed professors on the frequency of addressing curriculum aspects of digitization in departments and the senate (n=10)

	CURRICULUM ITEM	**MEAN**	**0**	**1**	**2**	**3**	**4**	**5**	**6**
22	Objectives of introducing digitalization into education	2,20	2	5	2	1	0	0	0
23	Educational content related to digitalization.	3,40	1	5	1	2	1	0	0
24	Organisational forms and teaching methods	1,60	1	4	3	2	0	0	0
25	Digitalization of educational materials	2,10	3	3	3	4	0	0	0
26	Digital competencies of the teaching staff	1,70	4	5	1	0	0	0	0
27	Digitization of knowledge assessment	1,60	1	3	5	1	0	0	0
28	Digitization of evaluations	1,00	1	8	1	0	0	0	0

added. Mathematics remains a key area, and the innovative area for this cycle was creative thinking. The top ten countries with the highest scores in the Programme for International Student Assessment (PISA) are China, Singapore, Estonia, Japan, South Korea, Canada, Taiwan, Finland, Poland, and Ireland. China leads with an impressive overall score of 578.7 points in the PISA study. Singapore secured the second position with a score of 556.3, Estonia is third with a score of 525.3, and Slovenia is ranked 11th, achieving a score of 503.8 points[11].

11th place for Slovenia in the PISA study is indeed a commendable result. However, it is essential to analyze the context behind it. We found that the primary school curriculum includes:

- more than 1,600 hours of instruction in the native language (Slovenian)
- more than 1,300 hours of instruction in mathematics
- more than 900 hours of instruction in various natural science subjects.

It is evident that the extent of instruction in these subjects is sufficiently large, and the quality of instruction in these subjects is also high enough to be reflected in the PISA results.

However, numerous documents have been adopted at the European Union level since December 2006, aiming to achieve a higher level of digital competence among citizens (which PISA does not measure).

At the primary school level in Slovenia, practically nothing has happened since 2006 (when the European Parliament adopted recommendations regarding lifelong learning) that would, at least in the following ten years, raise the level of digital competence among adolescents. To achieve a similar level of digital competence among adolescents as measured by the PISA methodology, it would be necessary to introduce a mandatory subject in primary schools. This has not happened yet due to frequent changes in governments and ministers. From 2006 to 2023, Slovenia has had 9 different governments, with the minister changing 11 times (one person served as minister twice). The Law on the Organisation and Financing of Education stipulates that the minister responsible for education adopts publicly valid educational programs, except for the educational programs of private schools.

The consequences of this could be catastrophic. As seen in the example of the PISA results, European Union member states are not leading, with Asian countries prevailing. Slovenia should immediately incorporate the same extent of computer science and informatics education into the primary school curriculum as all-natural science subjects combined. There is room for this in the curriculum, especially since almost 1,000 hours are allocated to arts education in the primary school curriculum.

Therefore, a first-year student enrolling in a Slovenian university will come with a relatively good knowledge of mathematics, having studied almost 2,000 hours, including hours in primary school and at least 560 hours in secondary school. However, at best, the total hours for subjects related to acquiring digital competence before university enrollment are 140 hours. Our research focused solely on faculties in social and business sciences. A student at such a faculty will likely take one more subject during undergraduate studies, with lectures and exercises totalling a maximum of 75 hours, usually even less. Typically, there are no such subjects at the postgraduate level. The extent of formal teaching content related to digital competencies within the public school system needs to be more significant. To illustrate, during the average duration of formal education in Slovenia, a citizen listens to approximately 2,000 hours of mathematics, about 1,000 hours of arts education, and only 200 hours of computer science and informatics education. With such a ratio of instructional hours, it is not feasible for citizens to achieve the same level of digital competence through formal education as they might, for example, in mathematics.

Most research, including ours, indicates that students possess a certain level of digital competence. Therefore, there is no doubt that students acquire knowledge and competence from formal curricula in public schools and outside sources. Part of this occurs within the "hidden curriculum," and a portion occurs outside the school environment.

In our research, we were interested in exploring what happens in subjects whose content is unrelated to computer science, informatics, and digital competence. Additionally, the professors teaching these subjects are not computer science and informatics specialists. We were curious whether, even in these subjects, students might be acquiring digital competence. Thus, we investigated the phenomenon known in theory as the "hidden curriculum." In our study, we examined the hidden curriculum with ten professors from ten different faculties in the field of social and business sciences.

Digital competence that professors most frequently incorporate formally into the curricula of subjects in the field of social and business sciences include:

- Browsing the web, searching, and filtering data, information, and digital content
- Sharing through digital technologies
- Collaboration through digital technologies
- Developing digital content

Digital competence that professors most frequently include in the curriculum, even though they are not part of the formal curriculum, are:

[11] OECD (2022): PISA Scores by Countries

- Protecting personal data and privacy
- Managing data, information, and digital content
- Managing digital identity

Martzoukou et al. (2020) based on their research in three countries, argue that existing definitions and perspectives in the field of digital competence go beyond the use of technological tools or media, focusing on shaping a mindset of digital literacy that develops throughout life. However, higher education strategies still need to catch up with this agenda. Our research findings do not provide a basis for agreeing with this.

We have identified a favorable "mental model" towards digital competence among university faculties. The idea is reflected in the relatively high frequency of addressing digital curriculum content in Senate meetings, departments, and other bodies of the faculties. It is worth noting that our focus was on faculties in the social and business sciences rather than technical faculties. We recognized that professors incorporate "digital" content into the curricula of subjects and engage in discussions about the digital curriculum. In this, we see a significant difference in the mindset of the staff between faculties and lower levels of education.

While it is true that faculties have a considerable degree of autonomy in designing curricula (within the framework of accreditation of study programs), public programs at lower levels are prescribed by the Minister of Education. However, it surprises us that, at least within elite circles in the educational field, there needs to be more mental shifts to give greater attention to digital competence at lower levels. The mindset towards digital literacy needs to be more decisively at lower levels of education. We fear that decision-makers are aware of the need for digitization, but when designing curricula for primary and secondary schools, interests may take precedence over anything else.

Ultimately, we were interested in the essential aspect: students' level of digital competence. Firstly, we did not identify significant differences in the level of competence among different content areas. Nevertheless, there are differences among specific competencies.

The highest level was identified in the following competence:

- Netiquette
- Interaction through digital technologies

These are the only two competencies where the arithmetic mean of responses is 5 or higher. The result means that respondents are capable of providing support to others.

The lowest level was identified in the Programming competency. On average, respondents need help performing common tasks and solving simple problems. The arithmetic mean of the other competencies indicates that respondents can operate independently and according to their own needs. The results also show that students need help with more advanced tasks and solving complex problems with a limited number of solutions.

To some extent, we agree with (Ballantaine et al., 2007) findings, which highlighted the typically overestimated computer competencies of surveyed students based on self-assessment questionnaires. An interesting finding in our research is that for any competency, we did not find respondents capable of assisting others. In this aspect, respondents certainly did not overestimate themselves. They were self-critical enough to recognize that they were not capable of helping others. On the other hand, the self-assessed level of students' digital competencies mostly stops at tasks they perform for their own needs. The level of their own needs can, of course, vary significantly. In this part, self-assessment cannot be objective.

5 Conclussion

In researching the field of digital competencies, we were surprised by the lack of tools that would objectively measure the level of digital competencies. Both DigiComp 2.1 and DigiEdu, representing the most widespread and formally accessible documents for measuring digital competencies in the EU, have not undergone any significant updates or changes in recent years. Suppose European Union countries aim to reach the level of some Asian countries. In that case, they need to develop a more advanced tool for measuring the levels of digital competencies, following the example of PISA.

Despite objective criteria for measuring the level of mathematical competence and the reliance on self-assessment questionnaires for measuring digital competencies, we dare to assert, based on the research results, that there are differences between mathematical and digital competencies. Throughout the history of education, it has been known that primary and secondary school students and even university students have helped each other. Historical records even indicate that many students supported themselves through tutoring. However, our research found that, on average, surveyed students need help to support others in most digital competencies.

Of course, our research has limitations. We have already mentioned that most research on digital competence levels is based on self-assessment questionnaires. One of the aforementioned weaknesses of such questionnaires was that respondents tend to rate their level of competence as higher than it is. This factor is purely subjective. However, we suspect that the self-assessment of digital competencies may also be influenced by the culture of a society. We know that culture has different dimensions, including performance orientation, future orientation, etc. Therefore, it would be worthwhile to investigate the impact of a society's culture on digital competencies in future research.

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Digitalne kompetence v formalnem in skritem kurikulumu

Ozadje in namen: Raziskovanje področja digitalnih kompetenc je eden izmed najpomembnejših političnih ciljev na področju izobraževanja v Evropski uniji že skoraj dve desetletji. Leta 2017 sta bila objavljena dva zelo pomembna dokumenta: DigComp 2.1 - Okvir digitalnih kompetenc za državljane z osmimi stopnjami usposobljenosti in primeri uporabe ter Evropski okvir digitalnih kompetenc izobraževalcev - DigCompEdu. Kljub tem dokumentom in vsem raziskavam na področju digitalnih kompetenc še vedno ni enotnega instrumenta za merjenje digitalnih kompetenc državljanov. Težava je v tem, da digitalne kompetence obsegajo širok nabor veščin, od osnovne digitalne pismenosti do naprednih tehničnih veščin, in se razvijajo s tehnološkim napredkom. Raziskovalci in odločevalci se srečujejo s številnimi ovirami pri ustvarjanju enotnega orodja za ocenjevanje teh kompetenc. Članek zato razširja obstoječe raziskave na področju digitalnih kompetenc v formalnem izobraževanju v Sloveniji. Raziskava je usmerjena v raziskovanje učnih načrtov pridobivanja digitalnih kompetenc na treh ravneh formalnega izobraževanja ter ravni doseganja digitalnih kompetenc med državljani (študenti) v Sloveniji. Namen študije je pridobiti širše razumevanje, kako udeleženci v formalnem izobraževanju pridobivajo digitalne kompetence za pridobitev javno priznane kvalifikacije v izobraževalnem sistemu v Sloveniji.
Načrt/Metodologija/Pristop: Da bi preučili področje digitalnih kompetenc v formalnem in prikritem kurikulumu, je bila najprej izvedena anketa med študenti (državljani) s ciljem ocenitve njihove samopodobe glede digitalnih kompetenc. Zatem so bili izvedeni intervjuji med učitelji z različnih fakultet, da bi identificirali elemente prikritega kurikuluma. Tretji del raziskave se je nanašal na pregled in analizo javno dostopnih izobraževalnih vsebin v osnovnih in srednjih šolah ter univerzah glede tem, povezanih s pridobivanjem digitalnih kompetenc.
Rezultati: Obseg formalnega poučevanja vsebin, povezanih z digitalnimi kompetencami znotraj sistema javnega šolstva v Sloveniji, je majhen. V času povprečnega trajanja formalnega izobraževanja državljan Slovenije posluša približno 2.000 ur pouka matematike, približno 1.000 ur pouka umetnosti in 200 ur pouka računalništva in informatike. Rezultati raziskave so pokazali, da na fakultetah tudi pri predmetih, katerih vsebina ni povezana z računalništvom in informatiko, študenti pridobivajo digitalne kompetence kot del skritega kurikuluma. Aritmetična sredina ostalih kompetenc kaže na to, da vprašani zmorejo delovati samostojno. Rezultati ravni digitalnih kompetenc po DigiComp 2.1. kažejo, da razen pri dveh kompetencah, pri nobeni ni presežena raven 5. Samoocenjena raven digitalnih kompetenc študentov se je pri večini kompetenc ustavila pri opravilih, ki jih študenti opravljajo za njihove lastne potrebe.
Zaključek: V prihodnosti bodo države EU morale standardizirati sistem ocenjevanja digitalnih kompetenc, da bi določile raven digitalnih kompetenc posameznikov. Šolski sistem v Sloveniji bo moral vključiti pomembno količino znanja s področja računalništva v učne načrte predmetov, pri čemer bo treba posebno pozornost nameniti nadgradnji digitalnih kompetenc znotraj prikritega kurikuluma.

Ključne besede: *Formalni kurikulum, Skriti kurikulum, Digitalna kompetenca, DigiComp 2.1*