INITIAL EVALUATION STUDY ON APPLYING ICT IN TECHNICAL PROFESSIONAL EDUCATION

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Initial Evaluation Study

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Abbreviations

SER	SPECIAL EDUCATIONAL REQUIREMENTS
TPE	TEHNICAL PROFFESIONAL EDUCATION
ME	MINISTRY OF EDUCATION
ICT	INFORMATION AND COMMUNICATION TECHNOLOGIES

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1. EXECUTIVE SUMMARY

The present report was elaborated by Civitta Company, and represents an initial evaluation study, which was elaborated under the project „Digital Competences for Employment in Modern Economy", implemented by the Educational Centre Pro Didactica and financed by Austrian Development Agency (ADA).

The report presents results of the initial evaluation study of the ICT development and integration level in technical vocational education in the Republic of Moldova, aiming to identify main challenges and problems of the Centres of Excellence, vocational schools, and colleges specialised in pedagogy, transport (auto) and IT.

The report consists of 7 Chapters: 6 Chapters are focused on the sphere of evaluation and one Chapter is a legal framework in using ICT in Technical Vocational Education (TVE). The structure of the Report is the following:

- ✓ Analyse Legal Framework on using ICT in Technical Vocational Institutions
- ✓ Examine students' digital competences from Technical Vocational Institutions
- ✓ Study the teaching-learning-evaluating process in the view of ICT integration, identify the main requirements and difficulties.
- ✓ Analyse the Infrastructure and Digital Equipment in Technical Vocational Institutions
- ✓ Analyse Teaching Materials within ICT perspective and make the content digital
- ✓ Investigate main barriers to integration, and ways in which ICT could help increase access for vulnerable, or students with SERs to technical TVE
- ✓ Study management processes and identify the main requirements and difficulties in the process of the main needs and obstacles in the process of ICT integration in the management of Technical Vocational Institutions.

LEGAL FRAMEWORK OF USING ICT IN TVE

An investigation of the international practice and mainly European experience, confirms an existence of a well-developed Digital Competences (DigComp) framework, which covers the category of general people, as well as teachers in educational institutions.

Depending on the target group, Standards cover different areas of competence. The Standards of Digital Competence designed to all citizens, include the following areas of involvement: i) Information and data management, ii) Communication and cooperation; iii) Create digital content; iv) On-line safety; v) Problem solving.

Digital Competency Standards for Teachers are focused on using ICT in the Teaching-Learning-Evaluating process, emphasizing the following: i) Develop Teaches professional skills in using ICT for communication, cooperation and on-going training; ii) Identify, create and share digital resources; iii) Manage and use digital technology in teaching and learning processes ; iv) Use digital technology and strategies to improve the evaluation process ; v) Use digital technology to enhance participation, personalization and active involvement of students and vi) Develop digital competences for students.

As far as standards for educational institutions are concerned, they include over 70 description and provide a comprehensive and broad conceptual framework that reflects all characteristics of the process of systematic integration of digital learning in educational institutions in all educational sectors. It is adjustable to specific content, which are used by educational organizations, intermediaries, or project developers.

The Legal Framework of the Republic of Moldova does not stipulates anything about the Digital Competencies Standards in the Technical Vocational Institutions. The only existing documents projected exclusively for Technical Vocational Institutions are the standards of minimum ICT equipment in Vocational institutions, which are out of date and do not meet the requirements of the institutions.

On the other hand, the existing standards of digital competence for students and teachers intended for general educational institutions, do not cover the areas of ICT training and further practise in the field. Thus, it is known that there is no legal framework for developing digital competences of students necessary to apply ICT in specialized areas.

Consequently, in addition to the lack of digital competence standards, the core curriculum of psycho-pedagogical and in-service teacher training modules do not contribute substantially to the digital skills needed by a teacher to apply ICT in the Teaching-Learning-Evaluating process.

On the other hand, it is detected that the digital competence evaluating mechanism for both teaching and management as well as students, is completely inappropriate, and the existing legal framework does not include mechanisms to motivate developing and applying digital competences in practice.

According to national legal framework, it is recommended to take over and approve the European Digital Competence Framework (DigiComp) and elaborate an accurate mechanism for evaluating digital competences for all actors in Technical Vocational Institutions. At the same time, it is recommended to develop a mechanism for financial motivation for teachers and management staff (by attributing a degree of competence, so as teachers and management should pass in order to prove their educational or managerial skills) for further develop and use digital competences in the teaching process.

DIGITAL COMPETENCES

Concerning the evaluation of the digital competence of students in technical vocational institutions, it is noticed that all of them have personal accounts in at least one of the social networks and at least one personal e-mail address (98.6%). At the same time, 77.6% of the students have a personal computer or laptop.

As far as the digital competences of students are concerned, the majority of students have minimum or weak digital skills and, respectively, do not meet the minimum requirements of digital competence established by the Ministry of Education. The worst case scenario is recorded in the Spreadsheets Documents Processing skills. Thus, only 15.9% of students have medium or high-level digital skills in this area, while 23% of students have no digital skills in tabular calculations and have failed to accumulate any points after testing.

The best situation is registered in case of electronic presentation documents, where 40% of students have average and high skills.

It should also be noted that the assessment indicated that the absolute majority of students in technical vocational institutions do not have high digital skills, such as spell check or the elaboration and building diagrams, and the accumulated score was mainly due to the elementary text editing.

Regarding the use of ICT tools for communicating and exchanging information in the virtual environment, over 85% of students use social network as the main communication tools with colleagues.

DIGITAL COMPETENCIES OF TEACHERS AND ICT USAGE IN TEACHING LEARNING EVALUATING PROCESS

The study shows that practically all TVE teachers have at least one e-mail address (97.8%) and a personal account in Social Networks (97.4%). Also, nearly all teachers have at least one Desktop computer or Laptop (94.8%). However, the rate of teachers regularly using ICT tools in the teaching process is low and only 26% of Teachers use these tools for more than half of the course hours.

Concerning concrete tools used by teachers in the teaching process, it is concluded that the most popular are text documents and power point presentations - 74% and 64% of teachers, respectively are using these tools.

One of the most seldom used tools in the teaching process is Tabular Computing, only 27% of teachers use this tool during the lessons.

As far as the learning process is concerned, the most popular tools used by students are Video spots, 59% of students accessing this tool. Digital images used by almost 54% of students, have a high level of popularity.

Tabular Computing documents are used by only 20% of students, which to some extent explains the extremely low rate of students with digital skills in this field.

A survey shows that the tools mostly often used by teachers are text documents and electronic presentations, used by 52% and 50% of the questioned teachers, respectively.

According to the information included in the focus groups, the main obstacles in using ICT tools in the TVE process are the lack of necessary equipment, difficulties in the elaboration of comprehensive educational materials, the lack of consistent training in the development of this kind of materials.

INFRASTRUCTURE AND EQUIPMENT

In terms of infrastructure and technical equipment of TVE, the study shows that most institutions meet the minimum standards of requirements set up by the Ministry of Education, Culture and Research etc. Computer equipment correspond to national standards, but additional equipment (e.g. Interactive Table, Servers, and Networks) is modest, limiting the possibilities of integrating ICT into the teaching process.

The students used mostly desktop computers, which reduces mobility and the possibility of ICT integration in just a few classrooms in the institution, and computer engineering is not used to a large extent, such as interactive screen boards used to run power point presentations or text documents.

Every department in an educational institution has at least one laptop, and the level of providing teachers and administrative staff with corresponding equipment corresponds to established standards.

Although the requirements for getting minimum number of computers correspond to established requirements by all the TVE institutions included in the survey, none of them has specialised licensed software for specialty, only a small part of the educational institutions have licensed general purpose software (Operating Systems, Office, etc.). In order to ensure the educational process, teachers are forced to use unlicensed copies of specialized software.

ANALYSIS OF TEACHING MATERIALS

The development and use of digital teaching materials is more frequent in post-secondary vocational education institutions. In secondary schools, their own elaborations can be found much less, the digital teaching materials which they use are taken from external sources. A significant part of the teaching materials which was evaluated does not contain explicit information regarding the training process, the speciality and the course unit for which they are elaborated.

According to institutional copy write, where they are mentioned or it can be established, it comes out that the most part of the teachers of methodological materials under evaluation are used only in the educational institutions in which they have been elaborated. There are no mechanisms that would ensure interinstitutional cooperation in the development of digital teaching materials and their provision to all interested institutions / teachers.

A significant part of the teaching materials does not contain information about the author and / or the institution in which he is working. It is also not clear whether the above-mentioned materials have been approved by the methodological committees of the educational institutions.

Due to inconsistencies in copyright and related rights, only a small part of the digital educational materials elaborated in educational institutions is in the category of open educational resources. This prevents the efforts of the teachers and technical vocational education institutions from the same profile to focus their efforts on the development of quality digital teaching materials.

Digital teaching materials elaborated and/or used in educational institutions are mainly power point presentations and tests. There are also course supporters and methodical indications, but these materials are, de facto, traditional materials that have been transferred from paper to new digital media.

According to the methodical destination and the educational goals pursued, the digital materials developed and/or used in the educational institutions mainly refer to facilitating the teaching-learning-evaluating processes of the theoretical knowledge and less to the formation and development of the functional. The share of methodological materials that contribute decisively to the formation and development of functional-action competences, i.e. those with methodical exercises for training, training, simulation etc. is limited.

About half of the digital methodological material does not exist or there is a poor correlation between interactive multimedia elements and basic static contents. This fact shows that, often, in the elaboration of digital methodological materials the informatics issues dominate the methodological ones.

CROSSECTORIAL ASPECTS

The analysis shows the existence of a significant gender imbalance in favour of boys in TVE institutions, the only exception being the pedagogical field, where the proportion is contrary to the whole system and is 2 to 1 in favour of the girls.

With regard to students with SER, based on the managerial staff's statements, it is noted that ongoing education, especially transport and pedagogy, are not very accessible to students with SER to the complexity of curricular tasks and activities.

At the same time, a major problem of the integration of pupils with SER in the educational process in TVE is the lack of computer assistance in the educational institutions. Moreover, teachers believe that if the interactivity of the teaching process increases, the non-adaptation of ICT tools to the needs of pupils with visual, social or intellectual disabilities will be disadvantageous. On the other hand, in the case of students with locomotor disabilities or hearing and speech difficulties, increasing interactivity will provide them with certain advantages and ease their skills building process.

USING ICT IN MANAGEMENT PROCESSES

The analysis shows that in most cases the information management of TVE institutions is in an early stage, with only elementary tools such as e-mail and, occasionally, cooperative tools.

Most institutions do not have specialized software for human resource management. Following on-the-spot checks, it was found that in most institutions all information on human resources is stored on paper.

All the institutions analysed have a functional web page. However, the web pages of the institutions included in the study contain only general information and do not represent interlinked portals that can be used by the institution's management, teaching staff and students for educational purposes.

The use of ICT in financial processes is irregular, with only one TVE institution is using the electronic public procurement portal.

Institutions, mainly, do not have funds to purchase ICT equipment. These are usually purchased at the end of the calendar year when unused funds are being budgeted.

Reporting to senior hierarchical institutions is mostly done through ICT tools, in particularly by electronic mail. The digital signature is not used at all, documents being printed, signed, scanned and transmitted electronically. The main communication tools with affiliated institutions are phone and e-mail.

2. INTRODUCTION

The following report was developed by Civitta and represents an initial evaluation study conducted within the project **"Digital Competencies for Employment in the Modern Economy"**, implemented by the Education Centre PRO DIDACICTA and financed by the Austrian Development Cooperation (ADA).

The report presents the results of the initial evaluation study on the level of ICT development and integration in the Technical Vocational Education Institutions of the Republic of Moldova, in order to identify the main challenges and problems of Centres of Excellence, vocational schools and colleges with specializations in pedagogy, transport and IT.

2.1. STRUCTURE OF THE REPORT

The report is structured in 5 chapters and annexes:

- ✓ **Chapter 1: Expected Objectives and Outcomes of the Initial Evaluation**, which outlines the main objectives and expected outcomes as specified in the Terms of Reference
- ✓ **Chapter 2: Methodology** - presents the initial assessment methodology, the areas of evaluation, and the applied research tools.
- ✓ **Chapter 3: Analysis of the Legislative and Regulatory Framework** - present the analysis of the legislative and normative framework from the perspective of using ICT in Technical Vocational Education.
- ✓ **Chapter 4: Analysis of the Evaluation Areas** - presents the analysis and interpretation of the assessment tools applied in the project for each of the 6 areas of the initial evaluation.
- ✓ **Chapter 5: Logical framework of indicators -** presents the list of indicators elaborated on the basis of the applied evaluation tools.
- ✓ **Chapter 6: Conclusions and Recommendations** - Outlines the main conclusions of the initial evaluation as well as the recommendations set out in the Terms of Reference

The report focuses on the following elements:

- ✓ Analyse the teaching-learning-evaluating process from the perspective of ICT integration and identify the main requirements and problems.
- ✓ Evaluate the digital competences of students in Technical Vocational Institutions
- ✓ Analyse the Infrastructure and Digital Equipment in Technical Vocational Education Institutions
- ✓ Analyse Materials and content from the ICT perspective
- ✓ Analyse the main barriers of integration and ways in which ICT could help increase access for vulnerable students and / or students with CESs to technical TVE.
- ✓ Analyse the management process and identify the main requirements and problems in integrating ICT in the technical vocational TVE institutions.

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3. EXPECTED OBJECTIVES AND RESULTS OF THE INITIAL EVALUATION

3.1. OBJECTIVES OF THE INITIAL EVALUATION

The main objectives of the initial evaluation are aimed to identify the main challenges and problems Centres of Excellence are facing, as well as other technical vocational institutions in the process of integrating ICT into educational process.

At the same time, the study aims to establish the main indicators in the development and integration of ICT in technical vocational institutions specialized in pedagogy, transport and IT.

3.2. EXPECTED EVALUATION RESULTS

The expected outcomes of the initial evaluation study consist in carrying out a series of analysis and present a range of recommendations covering the areas of evaluation, namely:

- ✓ Analyse and present recommendations on teachers and managers skills in using ICT in classrooms as well as the degree of student fulfilment with the use of ICT in classrooms by the teachers
- ✓ Analyse curriculum products
- ✓ Analyse managerial electronic systems (including software) and strategic documents from the ICT perspective in the current management and training process implemented by professional vocational institutions, present recommendations to motivate the institutions' management in promoting ICT integration.
- ✓ Recommend 6 disciplines (specialized) for further ICT integration in the teaching process
- ✓ Investigate and make an inventory of equipment and infrastructure, including the existing ICT vs. the necessary one from the perspective of ICT integration in the training process
- ✓ Establish and propose a list of subjects and competencies that will serve as a source for the development of ongoing learning program among teachers, based on their needs.
- ✓ Establish and propose specific actions to ensure gender equality and increase access of students from vulnerable families or SER students to Vocational Technical Education
- ✓ Update the framework of reference indicators.

4. METHODOLOGY

4.1. GENERAL METHODOLOGYCAL ASPECTS. AREAS OF EVALUATION

The methodology for the initial evaluation of ICT development and integration level in the Technical Vocational Education Institutions in the Republic of Moldova was elaborated on the basis of the evaluation areas stipulated in the Terms of Reference. The research tools were selected in such a way as to ensure the objectivity and representativeness of the initial evaluation. The evaluation tools such as interview guidelines, focus group guides, equipment and infrastructure observation sheets, and digital competence evaluation tests for students have been elaborated on the basis of the objectives of the evaluated areas as well as the relevance for the groups of respondents.

The Terms of Reference set up six areas to be subject to the initial evaluation. These areas are the following:

THE TEACHING-LEARNING-EVALUATING PROCESS | The analysis of the mentioned area of evaluation is aimed to the level of ICT usage in the teaching-learning-evaluating process by VET teachers, as well as emphasising the definition of requirements and problems they face in the process of integration of ICT in pedagogical practice, evaluation and management of the classroom.

INFRASTRUCTURE AND EQUIPMENT | The evaluation of the mentioned area focuses on the analysis of the technical equipment, the available systems, the software support and the classrooms in the VET from the point of view of relevant normative framework, as well as ensuring the teaching-evaluating-learning process.

TEACHING MATERIALS |The analysis of this particular area has been aimed to evaluate teaching materials and curriculum products from the ICT perspective and make the content digital.

MANAGEMENT PROCESS | The analysis of this area is focused to evaluate the level of using ICT in the management process in professional vocational institutions as well as define the requirements and problems that the managerial staff encounter in the integration process of ICT in the management of the VET institutions.

HORIZONTAL ASPECT | The evaluation of this area is aimed to identify the number of vulnerable and SER students, as well as to identify the main obstacles for the integration process, and the ways in which ICT could contribute to increase the access of vulnerable / or SER students to TVE institutions.

DIGITAL COMPETENCES OF STUDENTS | This represented an evaluation of students' digital competences and establish the level of reference for the educational institutions from the target groups.

4.2. RESEARCH METHODOLOGY AND EVALUATION INSTRUMENTS

4.2.1. RESEARCH TOOLS AND METHODS

In order to achieve the proposed objectives and generate the expected results, a number of research methods and tools have been applied. Both the qualitative and quantitative evaluation methods were applied in the study. Different and relevant research methods were applied for each area of assessment, taking into account the specifics of the corresponding area.

In order to prepare the initial evaluation study, the following research methods were applied:

- ✓ Interviews - 13 semi-structured interviews were conducted among the management staff in Technical professional Education.
- ✓ Questionnaires - 1059 questionnaires were concluded. 609 were filled in by students and 450 by teachers of the TVE institutions.

- ✓ Tests - 609 tests (557 valid) were applied among the students who teach in pedagogy, IT and transport (automotive) in the TVE institutions. The tests covered 3 main areas: Text Processing, Tabular Calculations and Power Point Presentation elaboration. For each of the three areas, five different test domains, 5 different test options were elaborated.
- ✓ On-site visits - 13 site visits were carried out, which resulted in mapping the infrastructure and ICT equipment of the Technical professional Education Institutions using direct observation method.
- ✓ Target Groups - 3 target groups were organized, one for each area included in the initial evaluation study: pedagogy, IT and transport (automotive).
- ✓ Document revision – the teaching and curricular materials were analysed, the legislative, normative and policy framework in the area of ICT usage, as well as competencies relevant to TVE was analysed.

TABLE 1. STRUCTURE OF THE APPLICATION OF THE RESEARCH METHODOLOGY

EVALUATION AREA	TEST	TARGET GROUP	INTERVIEWS	QUESTIONNARE	DOCUMENT RESEARCH	SITE VISITS
Teaching-learning-evaluating process		3		1050		
Infrastructure and equipment					x	13
Teaching Materials		3			x	
Management Process			13			
Horizontal aspects		3	13	450		13
ICT students digital skills	600					
Tests	1 (600 participants)					
Questioners	2 (1050 participants)					
Focus groups	3					
Interviews	13					

4.2.2. EVALUATION TOOLS

For each of the research methods, evaluation tools have been developed which allowed a better understanding and evaluation of the areas set up by the Terms of Reference.

TABLE 2. TOOLS APPLIED BY THE EVALUATION AREA

EVALUATION AREA	RESEARCH METHODS	EVALUATION TOOLS
Teaching-learning-evaluating process	Target Group	Guide for Target Group implementation
	Questionnaire	Questionnaire for teachers
		Questionnaire for the students
Infrastructure and equipment	Site visits	Observation file
Teaching Materials	Target Group	Guide for Focus Group implementation
	Documents research	Guide for analysing teaching materials

EVALUATION AREA	RESEARCH METHODS	EVALUATION TOOLS
Management Process	Interviews	Interviews for teachers
Horizontal aspects	Target Groups	Guide for Focus Group implementation
	Interviews	Interviews for teachers
	Questionnaire	Questioner for students
	Site visits	Observation file
ICT students digital skills	Tests	Test – three areas of competence, 5 types of tests in each competence area.

4.3. SELECTING AND PROFILING RESPONDENTS

4.3.1. TARGET GROUP OF THE TECHNICAL PROFESSIONAL INSTITUTIONS

In the process of selecting technical professional institutions, the main criteria was to consider the provisions of the Terms of Reference, that stipulated selection of 13 institutions, out of which 5 are in IT area, 4 in the area of transport (automotive) and 4 in pedagogical area.

From the list of the Technical professional Education Institutions from all over the country, only institutions that have one out of 3 listed areas have been selected. As a result, 13 institutions have been chosen (5 in the IT area, 4 in the transport rea and 4 in the pedagogical area). Thus:

- ✓ 2 large - over 800 students,
- ✓ 7 medium - between 200 and 800 students
- ✓ 4 small - under 200 students.

Only institutions where most students are enrolled in a specialty (faculty) that relates to one of the areas of reference have been selected, the geographical position has been also taken into account.

Initially 5 institutions from Chisinau, 2 from Soroca and Balti, and 1 from the following locations: Cahul, Orhei, Stefan Voda and UTAG were selected. As a result of launching the process of implementing researching tools, one of the two institutions from Soroca refused to participate in the project, being replaced by an institution from Chisinau which correspond to the eligibility criteria mentioned above.

TABEL 3. LIST OF THE SELECTED INSTITUTIONS

NO.	NAME	FIELD	NR.OF PUPILS	REGION
1	Centre of Excellence in Informatics and Informational Technologies	IT	1750	Chisinau
2	Centre of Excellence in Energy and Electronics	IT	400	Chisinau
3	Technical College of TUM	IT	200	Chisinau
4	Vocational School from Ștefan Vodă	IT	24	Ștefan Vodă
5	Techniacal College from Bălți Municipality	IT	120	Bălți
6	"Iulia Hașdeu" College from Cahul	Pedagogical /IT	244	Cahul
7	Centre of Excellences in Transport	Transport	1600	Chisinau
8	Vocational School nr.6	Transport	177	Chisinau

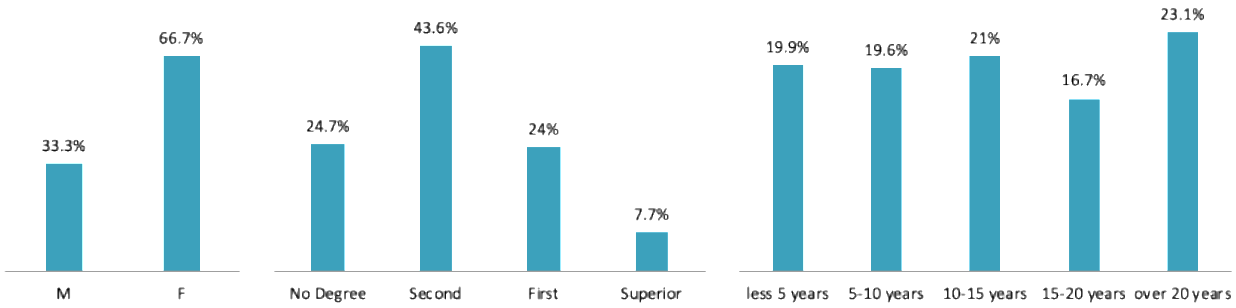
NO.	NAME	FIELD	NR.OF PUPILS	REGION
9	Technical-Agriculture College	Transport	218	Svetlîi
10	Vocational School nr.5	Transport	95	Bălți
11	Pedagogical College “Alexei Mateevici”	Pedagogical	200	Chisinau
12	Pedagogical College “Vasilie Lupu” from Orhei	Pedagogical	454	Orhei
13	Pedagogical College “Mihai Eminescu” from Soroca	Pedagogical	235	Soroca

4.3.2. QUESTIONNAIRE FOR TEACHERS

When selecting teachers for the questionnaires, it was taken into account three criteria: geographical location, areas (IT, Transport, Pedagogic), and the institutional criteria. Thus, the proportional selection of the total number of teachers working in each institution. From each institution a number of teachers were selected proportionally to the total number of teachers from the institutions included in the target group of the survey.

The selection of teachers within one institution used separate methodology, on the basis of alphabetical order of all the teachers in the institution, which resulted in selection of teachers with a predetermined step depending on the total number of teachers in the institution (depending on the total number of teachers in the institution the step was 3, 7 or 9 teachers) until reaching the necessary number to cover the number of participants from the institution.

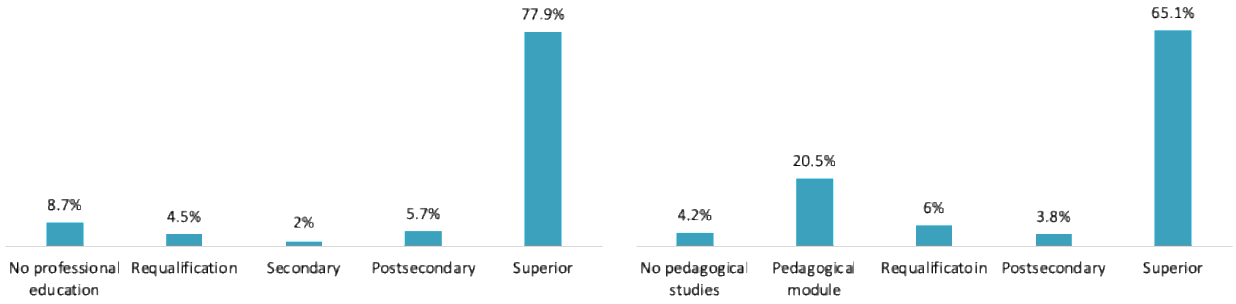
FIGURE 1. PROFILE OF TEACHERS: GENDER, TEACHING DEGREE, PROFESSIONAL EXPERIENCE, %



The majority of teachers have either the second degree or do not have a teaching proficiency degree in general, while most of the teachers surveyed have more than 10 years of professional experience, and almost 40% of teachers have a professional experience of over 15 years.

As far as the education of the teachers who have been questioned, the absolute majority of them have high pedagogical education in the subjects they teach, and only a small part have secondary vocational, post-secondary education or re-training courses. At the same time, almost 9% of the interviewed teachers do not have pedagogical education in the subjects they are teaching.

FIGURE 2. STRUCTURE OF (A) PROFESSIONAL AND (B) PEDAGOGICAL STUDIES OF THE TEACHERS INVOLVED, %

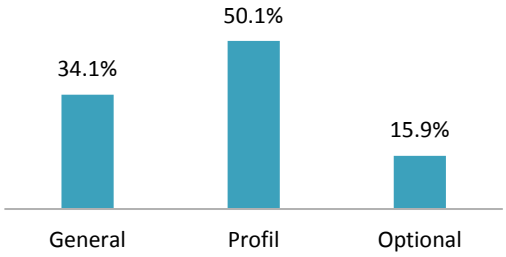


On the other hand, the rate of teachers with high education is 65.1%, while over 20% teach using psycho-pedagogical method. At the same time, the rate of non-pedagogical staff is only 4.2%.

At the level of the type of subjects, 71.7% of the teachers questioned teach one subject (speciality, general or optional), 26% teach 2 subjects, while 2.3% of the teachers questioned teach all 3 subjects.

Concerning the type of subjects, most of the teaching staff teach speciality subjects - 50.1%, 34.1% teach general subjects, while 15.3% teach optional subjects. At the same time, it should be mentioned that most of the teachers who teach optional subjects teach also the speciality subjects (71.8%) and 10.9% of those teaching optional subjects- both speciality and general subjects.

FIGURE 3. STRUCTURE OF TEACHERS QUESTIONED ACCORDING TO THE TYPE OF THE COURSE THEY ARE TEACHING, %



4.4. TESTING AND QUESTIONING STUDENTS

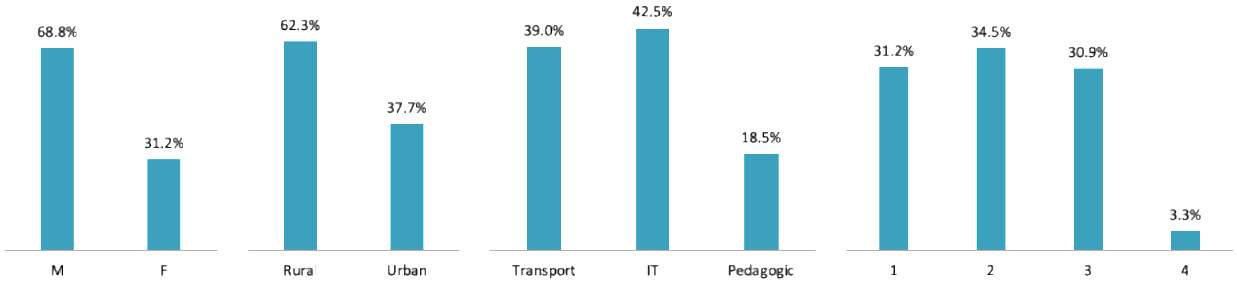
When selecting students for testing and questioning, the same principles were taken into account as in the case of teachers. Thus, the basic element in the selection process was the geographical position and the representative areas (IT, Transport, Pedagogical) as well as the institutional criteria. The proportional selection of the total number of students was based on the total number of students studying at the specialties relevant to the areas covered by the study, from each institution a number of students were selected in proportion to their number form all students studying at the specialties relevant to the areas selected from the institutions included in the study target group.

The selection of students within the institution used a separate methodology, in alphabetical order of all students from the corresponding specialties and selection of the students with predefined step depending on the total number of students on the list in the institution until the number required to cover the number of participants in the institution is reached.

In terms of student testing, 5 test options were elaborated for each of the three areas of competence assessed - Text Processing, Tabular Calculation, Power Point Presentation elaboration. The tests were assigned to the students according to the list concluded based upon the above mentioned methodology,

with respect to the order of the area and options (for example Student 1 - Text Processing V1, Student 2 - Table V1, Student 3 and so on).

FIGURE 4. PROFILE OF QUESTIONED PUPILS BY: GENDER, REGION, AREA OF STUDIES AND YEAR OF STUDY, %



Considering the specifics of the analysed areas, most of the tested and surveyed students were boys, the girls representing only 31.2% of the total. As far as the professional fields are concerned, there is a major difference in the gender of the respondents from one area to another. Thus, the lowest rate of girls is found in the transport area, where only 11.4% of the respondents were girls, while in the pedagogical area their rate is almost 80%.

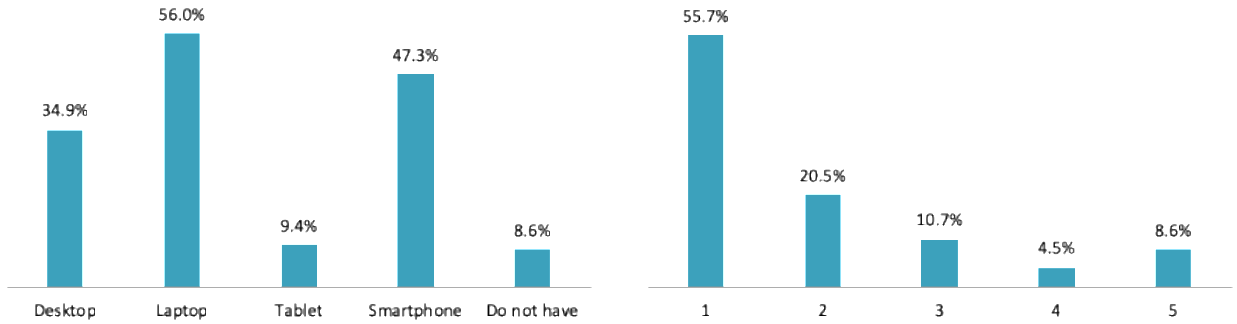
Regarding the environment in which the respondents graduated from the general education institutions before starting their studies in the technical professional education institutions, almost 2/3 of the students come from rural areas.

With respect to the structure by years of study, a balance was achieved, with an almost equal presence in the selected target group of students in the first, second and third years of study. The small number of students in the fourth year is due to the fact that most of them at the time of the study made their internship, consequently could not physically participate in the testing and questioning process.

Regarding the technical conditions, the number of students living in hostels and those living with their parents or relatives is approximately similar - 41.8% and 45.5% respectively, while the rate of those who are renting an apartment is about 12.7%. In the same context, most students have at least one electronic device (computer). Thus, 55.7% of respondents have at least one device, 20.5% have 2 devices, 10.7% three, and 4.5% all 4 devices (desktop, laptop, tablet, smartphone). At the same time, 8.6% do not have any device at all (computer).

Another results consists of relatively low rate of students who have a cell phone, which may mean either they do not have any mobile phones, or they do not see the phone as a device that could replace alternatively a computer.

FIGURE 5. TYPES (A) AND NUMBER (B) OF THE IT DEVICES IN STUDENTS' PERSONAL POSSESION, %



5. AN OVERVIEW OF NORMATIVE AND LEGISLATIVE FRAMEWORK

5.1. INTERNATIONAL EXPERIENCE

5.1.1. EUROPEAN UNION

At European Union level, there are 3 basic documents that set up the general framework for implementing information technologies in education. All three were developed aiming to provide a common, pan-European conceptual framework that would describe the digital competences of a citizen, a teacher and a learning institution appropriate for 21st century. These documents serve as benchmarks for Member States, and will develop and implement specific policies to apply these standards into life.

A) EUROPEAN FRAMEWORK FOR DIGITAL COMPETENCES FOR CITIZENS[1]

The European digital competences framework for citizens, also known as DigComp, provides a tool for improving the digital competence of citizens. DigComp was first published in 2013 and became a reference for numerous digital competences initiatives at both European and national level.

The framework was improved and structured in 2016 and 2017 by publishing updates 2.0 and 2.1. They completed the conceptual model, offered a new vocabulary, clarified the descriptions and specified 8 levels of competence. DigComp defines the key components of digital competence in the following 5 areas of competence:

1) Information and data management: specify information requirements, store and access data, information, and digital content. Assess the relevance of the source and its content. Storage, management and organization of the data, information and digital content.

2) Communication and cooperation: Interaction, communication and cooperation through digital technologies, awareness of cultural and generations diversity. Participation in society through public and private digital services and participation of citizenship. Management of identity and digital reputation.

3) Creation of digital content: create and edit digital content, improve and integrate information and content into an existing knowledge backbone, while understanding how copyrights and licenses are to be enforced. Elaborate instructions for a computer system.

4) Safety: Protect devices, content, or personal data privacy in digital environments. Protect physical and mental health and awareness of the impact of digital technologies on welfare and social involvement. Awareness of the impact of digital technologies on the environment.

5) Problem solving: identify the requirements and problems, solve conceptual problems and difficulties in digital environments. Using digital tools for innovation of processes and products.

Self-evaluation tool: https://ec.europa.eu/eusurvey/runner/DigCompEdu-SEN

B) THE EUROPEAN FRAMEWORK OF DIGITAL COMPETENCES FOR TEACHERS[2]

The European Framework of Digital Competencies for Teachers (DigCompEdu) is a document published in 2017 that describes what digital skills are necessary to teachers in their professional activity. It provides a general reference framework for the development of teacher-specific digital competences in Europe. DigCompEdu addresses teachers from all levels of education, from pre-school to higher education,

[1] https://ec.europa.eu/jrc/en/digcomp/digital-competence-framework
[2] https://ec.europa.eu/jrc/en/digcompedu

and is also applicable in the context of general education, children with special educational needs, initial and in-service training, as well as vocational-technical education.

The six areas of digital competence focus on various aspects of teachers' professional activity:

Domain 1 : Professional development. Use digital technologies for communication, collaboration and professional development.

Domain 2 : Digital resources. Identify, create and share digital resources.

Domain 3 : Teaching and learning. Manage and use digital technologies in teaching and learning.

Domain 4 : Evaluation. Use digital technologies and strategies to improve the evaluation process.

Domain 5 : Acknowledge students. Use digital technologies to enhance involvement, participation and active engagement of students.

Domain 6 : Develop digital competences for students. Create circumstances, where students can creatively and responsibly use digital technologies for information, communication, content creation, and problem solving.

C) THE EUROPEAN FRAMEWORK OF DIGITAL COMPETENCES FOR EDUCATIONAL INSTITUTIONS[3]

The DigCompOrg framework has seven key elements and 15 sub-elements that are common to all educational sectors. For each of the DigCompOrg elements and sub-elements, a series of descriptions (74 in total) have been elaborated. DigCompOrg provides a comprehensive and broad conceptual framework that reflects all aspects of the process of systematically integrating digital learning into educational organizations across educational sectors. It can be adapted to particular contexts in which educational organizations, intermediaries, or project developers operate.

The framework is complemented by a self-evaluation tool developed by the European Commission - SELFIE[4]

5.1.2. UNESCO

ICT TEACHER COMPETENCE FRAMEWORK[5]

The ICT Teacher Competence Framework is a document developed and published in 2018 by UNESCO. The teachers' ICT skills framework come to meet the challenges of modern society and the constant increase in digital technology of the main working process.

The competence framework consists of 18 basic skills, structured on the basis of the six aspects of teacher's professional practice, grouped in three levels of ICT use in pedagogical practice. The fundamental idea is that teachers who have the skills needed to use ICT in professional practice will provide quality education and ultimately will be able to effectively guide the development of ICT skills for students.

At the level of structure, the framework focuses on the following aspects of teachers' professional activity:

1. Understand the role of ICT in the Education process
2. Curriculum and student evaluation
3. The process of teaching-learning-evaluating
4. Apply digital skills
5. Management and organization process
6. Continuous teacher training.

[3] https://ec.europa.eu/jrc/en/digcomporg/framework
[4] https://ec.europa.eu/education/schools-go-digital_en
[5] https://unesdoc.unesco.org/ark:/48223/pf0000265721

Regarding levels of competence training, the Framework provides three levels:

- ✓ **Obtain knowledge -** requires teachers to get knowledge about how to use digital technologies. The level of knowledge acquisition aims at educating teachers on benefits of using ICT in classrooms.
- ✓ **Upgrade knowledge** - requires teachers to acquire ICT skills to enable them facilitate the formation of a focused-learner, combined, cooperative learning environment. At the same time, the teachers who reach this level have the competence to connect the educational policies with the concrete activities in classrooms, have the capacity to develop technological plans that cover the needs of the educational institution in the computing technique. At the same time, at this level, teachers have the ability to study through the use of professional networks at both national and international levels.
- ✓ **Knowledge Foundation** - At this level, teachers acquire skills that help them develop good practice models and form learning environments that encourage students to create the necessary knowledge for a harmonious and prosperous development of society. Teachers who have reached this level of competence have the necessary training to be able to come up with critical analysis of institutional or national educational policies, proposals for revisions of educational policy papers, etc.

5.1.3. OTHER SOURCES OF REFERENCE

EUROPEAN COMPUTER DRIVING LICENSE (ECDL)

European Computer Driving is a European Digital Competence Certificate internationally recognized.

The ECDL program defines required skills and competencies to use a computer and common computer applications. It offers a wide range of modules, including Computer Basics, Text Processing and IT Security.

ECLD provides three types of modules depending on the applicant's level of skills: Basic, Medium and Advanced Levels, each of these levels are aimed to develop digital competences in the corresponding area.

Each level of competence includes a set of modules, such as Text Processing, Tabular Calculation Computer Basics. For medium and advanced modules, the applicants are tested in the areas of IT Security, Web Editing, Project Planning, 2D Design, Image Editing, etc.

5.2. AN OVERVIEW OF THE LEGAL FRAMEWORK TO BE IMPLEMENTED IN TVE INSTITUTIONS

The area of Information and Communication Technologies is recognized by the Government as a priority for the future of the Republic of Moldova. At the same time, information technologies are progressively used in industry and service providing, so as digital skills become more and more important in getting competitive labour market benefits.

The Technical Vocational institutions are the main ones providing specialists in labour market. Referring to requirements and needs of the modern labour market, the digital skills training of students in Technical Professional Education is one of the main challenges for the responsible authorities.

From the organizational point of view, the development of digital competences, both general and professional, requires a strong and comprehensive legal framework covering all aspects necessary to ensure an effective educational process.

Once elaborated and implemented, the Legal Framework should facilitate a number of tangible and achievable objectives for each of the actors involved

TABLE 4. OBJECTIVES OF THE LEGAL FRAMEWORK IN THE FIELD OF ICT NTEGRATION IN TVE INSTITUTIONS

N / A	STUDENTS / TVE GRADUATES	TEACHERS	MANAGERS
1	Have general ICT skills	Have general ICT skills	Have general ICT skills
2	Have ICT specific skills for specialization	Have ICT skills required for application in the overall TEACHING process	Have ICT skills for applying in educational management
3		Have the necessary ICT skills to train ICT-specific skills	

The application of ICT in the TVE education process, both for management, teachers and students, has a significant role to play in guaranteeing good governance of TVE institutions and ensure development of high professional skills among graduates.

From a structural point of view, a legal framework necessary to ensure the implementation of ICT in educational processes in TVE can be divided into three basic components:

i) Develop Digital Competencies of Managers (Managers, Teachers and Students)

ii) Evaluate digital competences and their application in educational processes

iii) Provide necessary equipment to apply ICT in educational processes.

TABLE 5. BASIC STRUCTURE OF THE LEGAL FRAMEWORK FOR THE DEVELOPMENT OF DIGITAL COMPETENCES IN TVE EDUCATION

	COMPETENCE STANDARDS	SKILLS DEVELOPMENT	COMPETITORS' EVALUATION	INFRASTRUCTURE AND EQUIPMENT
Managers	Digital Competence Standards from the Educational Management perspective	The curriculum model for the ongoing education of Management Staff (Educational Management subject) is adjusted for further application of ICT in the management process	Methodology for evaluation he Digital competence of Manages (from the Educational Management perspective)	Minimum standards for equipment and ICT infrastructure to ensure educational management.
			Rules for the attestation of senior management in TVET	
Teachers	Digital Competency Standards for teachers	University curriculum includes Informatics and is adjusted to the standards aiming to develop general digital skills	Methodology for evaluation Teacher Digital Skills	Minimum equipment and infrastructure standards for ICT implementation in EP
	Digital Competency Standards for teachers for further application in the process of teaching general subjects	Psycho-pedagogical module curriculum is adjusted to standards in order to improve skills required in use ICT in teaching process	Methodology for evaluating the application of ICT Tools by teachers	
	ICT Competence Standards per area of specialization	Curriculum for specialized subjects are adjusted to standards for developing skills in using ICT in the professional activities	Methodology of using ICT in the IEP process in specialized subjects	
			Teacher Qualification Regulations in TVET	
Students	General digital competence standards for TVE students	Curriculum for Information and Communication Technology subject is adjusted to develop general digital skills	Methodology for evaluating digital competences of TVE students.	Minimum equipment and ICT equipment endowment standards for TVE institutions to ensure the development of students' general digital competences
	Digital competence standards for ICT application by domains of specialization	Curriculum for specialized disciplines is designed to develop digital skills needed to use ICT in specific activities	Methodology for evaluating skills in using ICT in specific activities	Minimum standards for endowment with ICT equipment and infrastructure of TVE institutions to ensure the development of the digital competences of students required to use ICT in specific activities.
				Minimum standards for equipment and ICT infrastructure adjusted for SER students

The elaboration and implementation of the legal framework presented in Table 5 would ensure the normative coverage in developing digital competences of the main stakeholders during education program.

The developing of both competent and financial insurance elaborated in the Standards would set up at least a number of requirements that the TVE institutions have to take into account while getting Accreditation.

On the other hand, if the curriculum and the ongoing training courses include digital competence training modules, and use them in TVE, both in the general and the specialized courses, will result in gradual increase of digital competences of the teachers. In addition to above mentioned, it is important, especially in the case of ongoing training, to structure them by skills so that teachers can choose courses according to the level of competences they have.

The Digital Competence Evaluation component has two targets. On the one hand, the evaluation tools for students, teachers and managers are applied to regularly monitor the situation on sites and get involved in case of unsatisfactory results. On the other hand, the presence of the evaluation tools contributes to the internal motivation of the actors involved, which consequently, will increase the interest for individual learning.

5.3. LEGISLATIVE AND NORMATIVE FRAMEWORK FOR ICT INTEGRATION IN TVE INSTITUTIONS

5.3.1. EDUCATION CODE

The education system of the Republic of Moldova is controlled and is upholding its activities under the Education Code, approved by Law no. 152 as of 17.07.2014.

The principles of quality, relevance, social presence and equality are expressly stipulated in Article 7 of the Code as fundamental principles of the education system of the Republic of Moldova. The education model described in Article 6 of the Code provides, above all, to develop initiative spirit personality, capable of self-development, which has a system of knowledge and skills necessary for employment in the labour market.

Aticle 6. The education model
The education model for schools in the Republic of Moldova consists in developing an initiative spirit capable to self-development, which include a system of knowledge and skills necessary for employment in the labour market, as well as an independence of opinion and action, being open for intercultural dialogue in the context of the assumed national and universal values.

The tasks of the Technical Vocational Education under the Education Code convert the education model into concrete responsibilities and actions to facilitate the employment of graduates in the labour market. In line with Article 59 of the Code, the TVE system offers training programs for skilled workers, high skilled specialists, technicians, etc. .; offers upgrading programs for workers and specialists in various area, and facilitates the consolidation of workers' professional skills in line with labour market requirements.

Article 59. Technical professional education system
(1) The technical professional education system includes all educational institutions which offer programs in:
a) training of qualified workers, high level specialists, technicians and other categories of specialists in accordance with the National Qualifications Framework, the Catalogue of Vocational Training and Trades / Professions, Classification of Vocational Training, of specialities and qualifications approved by the Government, as well as ISCED levels 3, 4 and 5
b) Upgrade the qualification of workers and specialists in various fields of professional training;
c) strengthen professional skills of qualified workers in accordance with the requirements of the economy and the labour market.

The legal framework stipulates that the State Educational Standards in Technical Vocational Education are elaborated by the Ministry of Education, Culture and Research with the participation of the employers' representatives

Curriculum on modules / courses in technical professional education is developed by experts in the field, based upon their levels of education and vocational training areas. The Education Code provides that the Curriculum in Technical Vocational Education includes i) the activity educational plan and the educational plan per activities and specialities and activities, ii) curriculum on modules / courses, and iii) methodological guidelines in applying the curriculum.

Conclusion:

Therefore, it is noted that using information technologies in educational processes is not clearly delivered at the legislative level. However, based on the educational module and the objectives of Technical Vocational Education to facilitate strengthening workers' professional competencies in accordance with

labour market requirements, the use of information technologies is supported and promoted since they are in strict correspondence with labour market in the modern world.

5.3.2. SECONDARY NORMATIVE FRAMEWORK

Analysing the Secondary Normative Framework, it is important to take into account the provisions in Chapter 5.1 and evaluate the Legal Framework aimed to identify existing gaps in the normative structure of the Republic of Moldova and identify necessary steps to be taken to ensure the successful implementation of ICT in educational processes in Technical Professional Education.

DIGITAL COMPETENCE STANDARDS

The existing structure of Digital Competency Standards in Pre-university Education in the Republic of Moldova includes 2 types of standards, namely i) the Digital Skills Standards of Students in General Education and the Digital Skills Standards of Teachers in General Education.

As noted above, the existing legal framework does not provide Digital Skills Standards for Management Framework. On the other hand, the existing Digital Skills Standards for Teachers are intended for teachers in general education. In the case of Technical Professional education, besides the general courses, there are also specialized courses, which, furthermore, depend on the type and the characteristics of the specialty require different levels of digital competences, specific to the type and characteristics of the corresponding specialisation.

For students, there are also some Standards of Competence for TVE institutions. Existing standards can be applied exclusively in general education, but there are no Digital Competence Standards for specialized areas, which once achieved are able to facilitate the application of ICT in specific activities.

a) Digital competence standards for teachers in general education

Digital competence standards for teaching in general education (from here to the end of the "Standards" subchapter) were approved through the Directive 862/2015 issued by the Ministry of Education. Although the Standards are dedicated to teachers in general education, they provide that the target group to which they are addressed is made up of teachers in the pre-university system, which also applies to teachers in technical vocational education. However, it is important to note that Standards can be considered relevant only for the general subjects studied in TVE. In the case of specialized courses, there are no teacher competency standards.

Standards provides and evaluate 7 digital competence areas, each separated into three levels - basic, intermediate, advanced. Areas of competence include both teaching-learning-evaluating and educational management aspects, namely: *1. Digital communication, 2. Information management, 3. elaborate digital educational content, 4. Implement management applications schooling, 5. Educational content management systems (SGCE), 6. Use of digital equipment in education, 7. Comply with ethic and legal norms in the digital space.*

Standards are designed to cover both general digital competences and digital competences required for practical application of ICT in the Teaching-Learning-Evaluating process.

Each of the areas of competence is divided into three levels, which, afterwards, establish concrete skills necessary to the teacher in order to reach that level.

At the same time, the standards stipulate that the established levels of skills will serve as an indicator in the employment of teachers, but also in attributing qualification grades to teachers. However, as mentioned, the Regulation on Teacher Evaluation does not provide any specifications regarding the obligation to comply with digital competence standards.

On the other hand, it is noted that the Teacher Digital Standards are not linked to the Standards of Professional Competences of Teaches in General Education (OME 623/2016), which does not stipulate standards for the use of ICT in the education process.

Conclusion:

Digital Teaching Standards of Teachers in General Education is a complex document covering all areas of digital competences required by teachers for an easier delivery of the teaching-learning-evaluating process.

Evaluation of digital literacy of teachers is carried out based on the methodology for organizing and conducting the evaluation of digital literacy for teachers in general, learned, approved by Directive 428/2016 of the ME. The methodology establishes the evaluation mechanism and criteria. However, neither the Competence Standards nor the Methodology for Evaluating Competencies are linked to the secondary regulatory framework, and in particular to the Teacher Attestation Regulation, which does not include any ICT training obligations. At the same time, there is no coherence with the Teacher Competencies Standards, which hampers the teachers' achievement of the standards in question and delays ICT implementation in the education process.

b) Digital competence standards for students in primary, secondary and high school

The digital competence standards for students in primary, secondary and high school were approved by the Directive of the Ministry of Education 852/2015. The Standards are directed to formulate explicitly digital skills you need to train and develop in primary and secondary educational cycles. As in the case of Teachers, these Standards are intended for students in general education rather than those in technical vocational education and can be considered relevant only for general subjects. For specialized courses, as it was mentioned, there are no Digital Competence Standards.

Digital competences represent integrated knowledge systems, skills, attitudes and values shaped and developed through learning, which can be strengthened to identify and solve problems characteristic occurring in the accumulation, storage, processing and dissemination of information using tools provided by technology information and communication.

The standards provide 10 types of digital competences with integrated knowledge, skills, attitudes and values for each educational level - primary, secondary and, high school.

Conclusion:

The digital competences standards of primary, secondary and lyceum students are a comprehensive document that includes all areas of basic digital competences required for students in the educational process. Standards are based on a range of important and comprehensive national and international sources which make them reliable and relevant. At the same time, the integrated knowledge and skills systems are explicitly formulated for each level of study and competency, which offers the possibility of objective assessment of students' digital competences.

However, the Standards for TVE applications are relevant only for general disciplines, and the case of specialized courses there is a need to develop Digital Competency Standards for each specialization (IT, transport, pedagogy, textiles, etc.).

TABLE 6. COMPARATIVE ANALYSIS OF THE CURRENT STANDARDS FRAMEWORK VS. THE REQUIRED STANDARD FRAMEWORK

N / A	STANDARD	STATUTE	COMMENTS
1	Digital Competency Standards of Manages	X	There are no digital competence standards. Professional Skills Standards for Management do not include any Standards of Competence or Use ICT in the Management Process
2	Digital Teacher Competency Standards	V	

N / A	STANDARD	STATUTE	COMMENTS
3	Digital Teacher Competency Standards for application in the educational process to general subjects	V	Teacher competency standards are designed to cover the size of ICT implementation in the educational process. However, Standards are designed to cover general issues not only of the application of ICT in the education process.
4	ICT Competence Standards by areas of Specialization	X	
5	General digital competence standards of TVE students	V	Existing standards refer to general education and, in the case of TVE, can only refer to general subjects.
6	Digital competence standards for ICT application by areas of specialization	X	

COMPETENCES DEVELOPMENT

From the perspective of the Legal Framework, the development of digital competences is related to the structure of the curriculum framework and the way in which the development of digital competences is addressed in these documents, regardless of whether initial training or on going education is concerned.

In the case of teachers from educational area, no initial specialized training is included. Management staff can complete the ongoing training course in the sphere of Educational Management, in which they include the module for the development of digital competences necessary for the implementation of ICT in the management process.

Regarding TVE teachers, digital competence training can be divided into 3 categories, namely, the general digital competences, the digital competences necessary for the use of ICT in the education process and the digital competences needed to apply ICT in specific activities.

As a consequence, the development of digital competences for teachers is also ensured by different types of programs depending on their type and category. Thus, in the case of general digital competences, they should be developed within the general course of "Informatics'" or "Information Technologies" included in the university program regardless of the student's discipline and specialization. In the case of the digital competences necessary for the use of ICT in the education process, they are to be developed within the Psycho-pedagogic module. In the case of digital competences necessary for the application of ICT in specific activities, their development is to be integrated into the specialized curriculum

a) Curriculum for ongoing "Educational Management" [6]

The main document which serve as a background for the analysis has been selected from the ongoing training course "Educational Management"developed and maintained by the Institute of Educational Sciences. The ongoing training course provides 150 hours for face to face and 450 of individual activity.

Curriculum Structure provides 4 Thematic Modules, including Module C: Information and Communication Technologies in Education. The curriculum includes 5 chapters, which are: i) Microsoft Word applications, ii) Interactive PowerPoint lessons; iii) Educational software for discipline. Interactive panel, iv) e-learning platforms. Web pages, v) Evaluation / Exchange of experience and provides 60 hours of training, including 4 hours of lectures, 11 hours of practice and 45 hours of individual work.

[6] http://ise.md/uploads/files/1557941512_management-educaional-directori-de-instituie-de-nvmnt-general-profesional-tehnic.pdf

An investigation of the considered chapters shows that most of them are more in line with the ongoing training of teachers or more or less they can be considered as being designed especially for general digital competences.

At the same time, the Module does not foresee the development of digital competences in areas relevant to educational management such as i) Use of communication tools (drive, dropbox, etc.); ii) Use Human Resources Management Software; iii) Use of ICT tools in financial / accounting analysis, etc.

Conclusions: The curriculum of the ongoing course "Educational Management" does not contribute in any way to the development of the digital competences necessary for the application of ICT in the educational management. The existing curriculum facilitates, to a certain extent, the development of general digital competences, but the limited number cannot ensure an in-depth study and getting satisfactory skills.

b) Study Plan of the Philology Faculty, specialisation Languages and Literature; Romanian Language and Literature, State Pedagogical University "Ion Creanga"[7]

The study plan was taken as a model for analysing the integration of the framework for the development of the general digital competences of future teachers. The selection of the Faculty of Philology was selected being the most representative of general subjects, Romanian language being a subject studied in all pre-university education institutions in the Republic of Moldova.

The study plan of the Faculty of Philology, specializing Languages and Literatures is structured in 3 years of study and 6 semesters. In the 4th semester of the studies, the course "Information Culture and Information Technologies in the area" is studied as a subject of specialization.

The course includes 120 hours of training, of which 60 face to face and 60 hours of individual work. The structure of the course focuses on the development of general digital competences, but also teaching ICT in the field of philology, including the application of different specialized ICT tools.

c) Program of on-going professional improvement of teachers, State Pedagogical University "Ion Creanga"[8]

The program of on-going professional training of teachers developed and applied by SPU "Ion Creanga" has a structure consisting of 4 modules: i) Psycho-pedagogical, ii) methods of teaching, **iii) Information technologies for communication in the educational process,** iv) Personal development.

The duration of the ongoing professional training program for teachers is 600 hours, 150 hours per module, of which half are practical lessons, and the rest are individual.

The Module C - Information Communication Technologies in the educational process provides for both general information such as Information and Communication as well as the development of digital competences necessary for the use of ICT in the teaching process.

Module structure includes the development of a range of specific competencies, including i) develop and implement software applications for ICT integration in order to optimize the educational process, ii) Elaborate and present power point presentations, and iii) Use interactive charts.

The structure of the ongoing training course, although it includes several aspects related to the application of ICT in the educational process, is more general in nature and the time allocated is insufficient for the development of complex digital competences. The course does not provide development of digital competences to facilitate the growth of an interactive educational process or to train teachers in areas such as communication tools.

d) On-going courses , Technical University of Moldova TUM[9]

[7] https://www.upsc.md/wp-content/uploads/2017/03/stud_fac_fil_limb_lit_rom_2013.pdf
[8] https://formare.upsc.md/oferta-de-programe/
[9] http://cfc.utm.md/formare-continua-specialisti/cursuri-de-perfectionare/

In the case of teachers, the general digital skills and ICT skills needed in the education process play an important role both in general education and in TVE. However, the case of Technical professional Education, it is less important for teachers to have digital competences necessary for the application of ICT in the specialized fields.

The training of the digital competences necessary for the application of ICT in the specialty areas normally appear alongside with professional training of the teachers. However, due to permanent evolution of technologies, ongoing training in digital competencies is needed to apply ICT in the areas of expertise.

In this regard, it is noted that most of the in-service training courses do not include digital competence development activities necessary to apply ICT in the specialized fields. Out of the total of 19 domains analysed only in the fourth case there are some activities that facilitate the development of digital competences necessary for the application of ICT in the given specialty.

Conclusion:

The legal framework for the development of digital competences of teachers in technical professional education is well developed. Regarding the development of general digital competences, there is a well-developed and comprehensive legal framework. Information technologies are a subject studied at all investigated faculties, including the Faculty of Philology, Thus the existence of a legal framework to facilitate the development of basic digital competences can be considered as set up.

As far as the development of digital competences necessary for the application of ICT in the education process is concerned, there is a broad spectrum of ongoing training modules on the educational market that foresee the development of these competences. However, a detailed analysis of the mentioned modules shows that at the structure level they are rather simple and do not cover the full range of digital competences needed by a teacher for the successful application of ICT in the educational process.

The biggest problems are found in the field of developing digital competences for the use of ICT in the specialized fields. On the one hand, there are no standards of digital competences of teachers for the application of ICT in the specialized fields, on the other hand the technological underdevelopment of the Republic of Moldova is a major impediment to the overall application of ICT in industries, which, as a result, will complicate the development of continuous training courses in this respect.

e) Curriculum for Informational Technologies and Communications for the TVE educational institutions[10]

The purpose of developing the mentioned curriculum consists in modernize and make more efficient the technical vocational education to increase the competitiveness of the national economy by training the competent and qualified workforce, in accordance with current and future labour market requirements.

The curriculum aims both at developing general digital competences and digital competencies specific to the area of activity. At the level of the structure, the curriculum is partly linked to the Digital Skills Standards for Students in General Education - the only standards of digital competence for students in the Republic of Moldova.

According to its structure, the curriculum consists of 6 modules with a duration of 336 hours of study, of which 72 hours of lectures, 108 hours of practice and 156 hours of individual work. The training modules aim to create digital competences in the areas of: i) Use operating systems; ii) Use peripheral equipment, iii) Text editing, iv) Tabular calculation; v) Multimedia technologies and vi) Communication technologies.

The analysis of the learning units included in the mentioned curriculum denotes the fact that these modules to a big extent relates to the development of general digital skills rather than to the digital competences necessary for the use of ICT in the specialized field. At the same time, in the absence of standard of digital competence for TVE students, it is hardly to notice the standards the curriculum is

[10] https://mecc.gov.md/sites/default/files/curriculum_tic_ome_nr._662_din_12_iulie_16.pdf

directed, as well as the mechanism for evaluating competences formed by the implementation of the curriculum.

f) Curriculum of the speciality classes in TVE institutions

In order to analyse the degree of adjustment of the curriculum to develop the digital competences necessary for the use of ICT in specific activities, 3 curriculum applied to the Technical Education were selected, namely:

i) Curriculum of Specialty and Electronic Auto Equipment[11]

ii) Curriculum of the Electro-energetic Specialty[12]

iii)Curriculum of Technical Diagnosis for Auto Transportation Speciality[13]

iv) Curriculum of Specialty for Primary Education[14]

The analysis of each modular curriculum denotes a useful use of digital competence development activities required to apply ICT in the specialized fields. Thus, in the case of the Electrical and Electronic Equipment Specialty Curriculum, the use of the development of competences in the use of ICT in the specialized field is carried out both within the "Technical assistance in computers" course and in the specialty "Safety and comfort systems" which includes the development of working skills with the vehicle's electronic diagnosis machine.

On the other hand, in the case of the Electricity Specialty Curriculum, it does not include disciplines to facilitate the use of ICT in the specialty. Moreover, the only discipline that contributes to the development of digital competences under the mentioned curriculum is that of "Computer Practice", which provides for the development of general digital competences, such as the use of text documents, spreadsheets or electronic presentation.

In the Curriculum for Automotive Technical Diagnosis, several courses focus on developing digital competences for the use of ICT in the specialized area. Thus, within this specialty, students develop computer-assisted technical design skills and also study thoroughly the use of ICT tools in the diagnosis process.

A different situation is recorded for Primary Education. For the specialization, the curriculum stipulates development of competences for the use of ICT in the education process only in the case of Music Education, in other cases the use of ICT in the educational process is ignored. Moreover, the Curriculum does not provide for the formation of General Digital Competencies and does not include any special training for this type of competency.

Conclusions:

Regarding the development of students' general digital TVE skills, there is a clear and comprehensive legal framework. At the same time, the existing legal framework is an optional one and is within the competence of the TVE institution whether or not it is included in the Specialty Curriculum. Moreover, the Legal Framework on the training of general digital competences of students in TVE is not linked to any Digital Competence Standard in TVE, but still has relevance to the Digital Skills Standards of Students in General Education. At the same time, due to the lack of Digital Skills Standards for TVE students, neither the mechanism nor the procedure for evaluating the mentioned competencies are clear. In this respect, it is vital to develop general digital competence standards for TVE students and to establish the mechanism for valuating these competencies.

[11] https://mecc.gov.md/sites/default/files/inventar_71630_echipament_electric_si_electronic_auto.pdf
[12] https://mecc.gov.md/sites/default/files/inventar_71310_electrotenergetica.pdf
[13] https://mecc.gov.md/sites/default/files/inventar_71620_diagnosticarea_tehnica_a_transportului_auto.pdf
[14] https://mecc.gov.md/sites/default/files/11310_inventar_invatator.pdf

The legal framework for development of competences in using ICT in specialized areas, contains, if many specialties, training activities for such competencies. However, for many specialties such actions are absent or irregular.

Another major issue related to the development of digital competences necessary to use ICT in specialized area is the lack of standards of students' skills in using ICT in every specialized area. Lack of the Standards make TVE institutions to implement actions to train students' digital competences, which is often manifested being completely absent from the curriculum.

TABLE 7 COMPARATIVE ANALYSIS OF EXISTING LEGAL FRAMEWORK IN THE FIELD OF DIGITAL SKILLS DEVELOPMENT VS THE REQUIRED ONE

N / A	STANDARD	STATUTE	COMMENTS
1	The Curriculum of Ongoing Training for Managers (Educational Management course) is adjusted to apply ICT in Management Process	X	The module for ongoing training of Management is included in the educational offer of several educational institutions with ongoing education. However, the structure of this module does not deliver development of digital competences necessary for the application of ICT in educational management, and is more relevant to the formation of general or necessary digital competences in the education process
2	The University curriculum includes informatics and is adjusted to standards for the development of general digital competences	V	
3	The curriculum of the psycho-pedagogic module includes and is adjusted to standards to develop the skills needed to use ICT in the educational process	V	
4	Curriculum for specialized courses is designed and adjusted to standards in the development of ICT use competences in professional activities	V	Partly, in the case of ongoing training, or re training, the current ongoing training programs have an irregular presence of ICT skills development activities in specific areas
5	Curriculum for specialized courses is designed to standards in the development of ICT use competences in activities connected to professional activities	V	Partial. Part of the Curriculums are adjusted and include ICT skills development activities in the specific areas of the profession, but in many cases this is ignored by the legal framework. .
6	The curriculum of Information and Communication Technology is adjusted to develop general digital competences	V	

EVALUATION OF DIGITAL COMPETENCES

Digital competence evaluation is a key element in their development process. Ensuring a comprehensive, clear and effective evaluation mechanism will lead to the motivation of all stakeholders to further develop the discussed competences.

Regarding the evaluation of digital competences, regardless of the stakeholders, the existing legal framework in the Republic of Moldova includes only 4 basic documents, namely:

i) Methodology for evaluating the digital competences for teachers

ii) Methodology for evaluating digital competences for students in General Education

iii) Teacher Qualification Regulations

iv) Regulation on Management Confirmation

The Methodologies for evaluating digital competence for students and teachers were approved by ME Directive 428/2016. At the level of structure, evaluation methodologies establish the mechanism and procedures for evaluating digital competences.

The methodologies stipulate the digital competence evaluation established by Digital Skills Standards for teachers and students exclusively for general education.

At the same time, the methodologies establish that the evaluations are voluntary and are requested by the beneficiaries - teachers or students in the 4th, 9th and 12th grades.

On the other hand, the Regulations for examining teachers and managers in general, technical and psycho-pedagogical education (from here to the end of the "Regulation" section) establish the mechanism, conditions and criteria for confirmation of teachers and managers, including technical vocational education.

Annex 3a for both Regulations establishes the Credit Card and a Methodology for Quantification, Accumulation and Recognition of Professional Credits (from here to the end of the "Map" section). The map provides for the ongoing activities that the Framework or Managerial Framework can take in order to obtain professional credits, the duration of the activity for the respective number of credits, as well as their obligation to obtain the accreditation first. The map does not establish the possibility of obtaining additional credits for carrying out ICT in-service training or for the use of ICT in the teaching-learning-evaluating process and the use of ICT in the management process. However, the Map provides for the possibility to get 10 credits for 75 hours of auditing in courses, internships, workshops or trainings at local, district and / or municipal level, without establishing the field in which these courses are to be carried out, what which offers teachers and managers the opportunity to carry out continuous training in the field of ICT use in educational processes.

Conclusions:

As can be seen from the analysis of the legal framework for evaluating digital competences, both for students, teachers and management staff, there is a lack of the logical path of Establishing competence standards - Skills training - Skills evaluation - Certification for obtaining some notorious results.

It is also noted that the digital competence evaluation mechanism is an optional one for all the actors involved and the lack of digital competences in no way influences the general success of the students or the process of certification of teachers.

Moreover, in the case of categories of persons such as management staff, the evaluation skills to use ICT in the performance of professional activities is not provided generally.

TABLE 8 COMPARATIVE ANALYSIS OF THE EXISTING LEGAL FRAMEWORK ON EVALUATION OF DIGITAL COMPETENCES VS. A REQUIRED ONE

N / A	STANDARD	STATUTE	COMMENTS
1	Methodology for evaluating Digital Skills of Managers (from the perspective of Educational Management)	X	
2	Rules for evaluation of senior management in TVE	V	It does not provide any obligations to develop digital competences and their use

N / A	STANDARD	STATUTE	COMMENTS
			in the management process for obtaining professional certification.
3	Methodology for Evaluating Teacher Digital Skills	V	It is a voluntary procedure and includes motivation elements as benefits such as salary growth in the case of positive certification or sanctions in the event of a poor outcome of the evaluation.
4	Methodology of Evaluating Teachers' Use of ICT Tools in education	X	
5	Methodology of using ICT in the educational process at specialized courses	X	
6	Teacher Qualification Regulations in TVE	V	No obligations in digital competences for using them in the process of obtaining professional certification
	Methodology for evaluating the digital competences of TVE students.	V	Although there is a methodology for evaluating digital competences of students in general education, it can only be partially related to the educational needs and curriculum of TVE students. At the same time, evaluation is a voluntary procedure and includes motivation elements

INFRASTRUCTURE AND EQUIPMENT

In the case of Technical Professional Education, the structure of the legal framework for endowment with equipment and infrastructure differs substantially from general education. For TVE, in addition to general subjects, specialty courses play a very important role, which in turn requires equipment and a specialized infrastructure to ensure high quality education.

Thus, for TVE, the legal framework for providing equipment and infrastructure besides the minimum equipment endowment standards required for the training of general digital competences must also contain minimum standards for endowment with the necessary equipment for the training of digital competences necessary for the application of ICT in the specialized fields.

At present, the legal framework in the field of infrastructure and equipment contains only one normative act -the Minimum standards of ICT equipment provision of the institutions of technical professional education. The standards mentioned above concern both the endowment of the institution from the point of view of providing the students with the necessary equipment for the development of general digital competences, as well as ensure teachers and managers to use ICT in the educational process and in the corresponding educational management.

a) Minimum standards for providing ICT equipment to institutions of technical professional education

The minimum standards for endowment with ICT equipment in technical professional education (hereafter referred to as "Standards") were approved by Directive 1043/2015 issued by the Ministry of Education. Standards provide minimum facilities for technical vocational education institutions. Standards include separate features for 3 types of offices: i) Classroom for IT course units; ii) the Department of Multimedia of the standard classroom; iii) the multimedia office of the governing body of the educational institution.

TABLE 9. MINIMUM EQUIPMENT NEEDED ACORDING TO THE OFFICE/CLASSROOM TYPE

N / A	COURSE CLASS	MULTIMEDIA DEPARTMENT	MANAGEMENT OFFICE
1	CD Computer - Desktop or Laptop	CD Computer - Desktop or Laptop Computer	CM Computer - Desktop or Laptop Computer
2	Student Computer - Desktop, Laptop or Tablet	Networking technology required to connect CD computer the Educational Institutions network	Networking technology required to connect the CM computer to the educational institution network
3	Network technology	Digital Multimedia Project	Multimedia (speakers, headphones, microphone, etc.)
4	Printer	Printer	Printer
5	Digital Multimedia Projector	Multimedia (speakers, headphones, microphone, etc.)	
6	Multimedia (speakers, headphones, microphone, etc.).	Camera	

Source: Directive 1043/2015 ME

At the same time, the Standards also provide minimum technical characteristics for computer technique used in TVE institutions.

TABLE 10 MINIMUM TECHNICAL (PERFORMANCE) CHARACTERISICTS OF THE ICT EQUIPMENT

N / A	DESKTOP	LAPTOP	TABLET
processor	2 GHz, with support for PAE, NX and SSE2	1.4 GHz	1.4 GHz
RAM	2 GB	2 GB	2 GB
Hard Disk	500 GB	320 GB	320 GB
Card Graph	Microsoft DirectX 9 with WDDM driver	Microsoft DirectX 9 or higher	Microsoft DirectX 9 or higher
Monitor	22 ', resolution 1366 x 768	15.6 ', resolution 1366 x 768	9.4 ', resolution 1024 x 768
Network	Ethernet, 100 MB	Wireless, 1 GB	Wireless, 1 GB

Source: Directive 1043/2015 ME

Eventually, minimum standards of endowment also provide a series of statistics indicators. Thus the student rate 1 computer per 20 students, and the minimum number of computers in an institution cannot be less than 25 units, of which 15 in the IT class and 10 in the administration office of the institution). At the same time, the Standards require having at least 3 computers in management office, 4 for teachers, 2 in the methodological room and minimum 1 computer in the library of the institution. Also, each TVE institution must have at least one multimedia projector and a projector screen.

Conclusion

The legal framework for equipment and infrastructure in education institutions is very poor. The only existing document refers to the Standards of Minimum Endowment of TVE Institutions is outdated and irrelevant under current conditions.

At the same time, existing Standards do not cover the provision of technical equipment necessary for the development of ICT skills in the specialized areas.

Taking the above mentioned into consideration, it is recommended to review the Standards and adjust them to the needs of the stakeholders. At the same time, it is imperative to develop Standards for each specialized area in order to ensure the process of developing competences necessary for the use of ICT in the specialized area.

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TABLE 11. MATRIX OF THE LEGAL FRAMEWORK FOR THE DEVELOPMENT OF THE DIGITAL COMPETENCES DEVELOPMENT IN VET INSITITUTIONS; GREEN – LF EXISTS, YELLOW – LF IS INCOMPLETE, RED – LF DOESN'T EXIST

	COMPETENCE STANDARDS	DEVELOPING SKILLS	COMPETITORS' EVALUATION	INFRASTRUCTURE AND EQUIPMENT
Managers	Digital Competence Standards from the Educational Management perspective	The Curriculum of ongoing training for Managers (Educational Management course) is adjusted to apply ICT in Management Process	Methodology for Evaluating Digital Skills of Managers (from the Educational Management perspective)	Minimum standards for equipment and ICT infrastructure to ensure educational management.
			Rules for the evaluation of senior management in TVE	
Teachers	Digital Teacher Competency Standards	The University curriculum includes informatics subject and is adjusted to standards for the development of general digital competences	Methodology for evaluating Teacher Digital Skills	Minimum equipment and infrastructure standards for ICT implementation in education
	Digital Teacher Competency Standards for application in the IEP process to general course	Curriculum of the psycho-pedagogic module in and is adjusted according to the standards in order to develop the competences necessary for the use of ICT in the educational process	Methodology of evaluating Teachers' Use of ICT Tools in education	
	ICT Competence Standards by area of Specialization	Curricula for specialized disciplines is designed to standards in the development of ICT use competences in professional activities	Methodology of using ICT in the educational process at specialized courses	
			Teacher Qualification Regulations in TVE	
Students	General digital competence standards of TVE students	The curriculum of Information and Communication Technology is adjusted to develop general digital competences	Methodology for evaluating digital competences of TVE students.	Minimum equipment and ICT equipment endowment standards for TVE institutions to ensure the development of students' general digital competences
	Digital competence standards for ICT application by domains of specialization	Curriculum for specialized courses is designed to develop the digital skills needed to use ICT in specific activities	Methodology for evaluating the skills of using ICT in specific activities	Minimum standards for endowment with ICT equipment and infrastructure of TVE institutions to ensure the development of the digital competences of students required to use ICT in specific activities.
				Minimum standards for equipment and ICT infrastructure adjusted for studnets With CES

6. AREAS OF EVALUATIONS

6.1. STUDENTS' DIGITAL COMPETENCES

6.1.1. INTRODUCTION

The assessment of digital competences of students in Technical professional Education has been made on the basis of the Digital Competence Standards for primary, gymnasium and lyceum students, approved by the Directive 852/2015 of the Ministry of Education. According to art. 60 of the Education Code, the admission to the Technical Vocational Education is based on at least the secondary school diploma, the minimum digital competences that the student must have at the end of the gymnasium cycle.

During the evaluation, the following digital competences were emphasised in the Standards: *1. edit text documents, 2. Create and edit images, 3. Elaborate, develop and disseminate electronic presentations, 4. Tabular Data process, 5. Use Internet, 6 Communicate in virtual environments.* The evaluation of the above mentioned competencies was carried out in 3 types of tests in which the students were given the task to create by duplicating an example provided in PDF format of a i) Text document; ii) a spreadsheet type document, and iii) power point Presentation, and a questionnaire.

TABLE 12. TYPE OF SKILLS EVALUATED FOR EACH TYPE OF DOCUMENT

N / A	TEXT	CALCULATION	PRESENTATION
1	Create and edit text documents.	Create and process computer documents	Elaborate power point presentation containing texts, images and multimedia files
2	Format characters, pages, and paragraphs.	Use spreadsheets to solve frequently encountered problems in daily work that require numerical data processing	Present a power point document in front of an audience
3	Structure and edit text.	Use databases in the form of lists for organizing and keeping information	Find information using search engines
4	Use grammar correction tools for texts	Create and format diagrams	Organize and manage downloaded information from the Internet
5	Insert objects into documents		Create and perform elementary vector image processing

At the same time, by applying the questionnaires the competence 6-Communication in virtual environments and Internet use was evaluated.

The rating scale for all three types of tests had a total of 60 points. In the process of evaluating students' competencies, the accumulated score rate was taken into account, and 4 categories were formulated as follows: i) 0-25% - minimum digital skills , ii) 25-50% - low digital skills, 75% - medium digital skills, 75-100% - high digital skills.

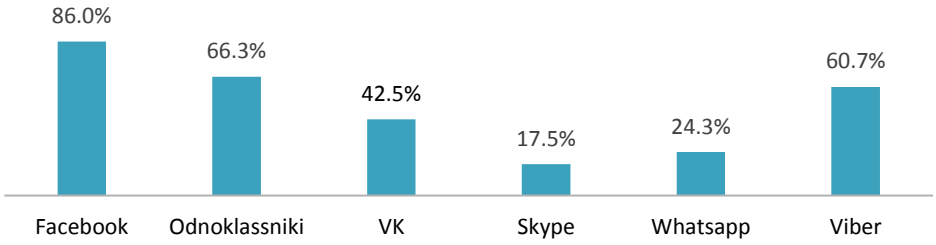
6.1.2. STUDENTS´ DIGITAL COMPETENCES

As mentioned in the previous chapter, a range of evaluation tools, both objective and subjective such as questionnaires, have been applied to evaluate students' digital competences, but they can still be a useful source of information for evaluating the level of using digital devices by students.

Questionnaire analysis shows that the absolute majority of students have at least one e-mail. The most popular extensions are gmail.com - 74% of respondents, mail.ru - 59% and yahoo.com -4.4%. At the same time, it should be noted that approx. 90% of students hold more than one e-mail address, the most popular combination being gmail.com and mail.ru with a share of 30.4% of the total respondents.

In the same context, it should be noted that 100% of students surveyed have a personal account at least on a social network, and most of them have accounts in more than three social networks at the same time. The most popular social networking is Facebook with a spread of approx. 86% of all students surveyed, followed by over 20% by the Odnoklassniki network. Virtually as popular as Odnoklassniki is instant messaging "Viber", with a presence of over 60%.

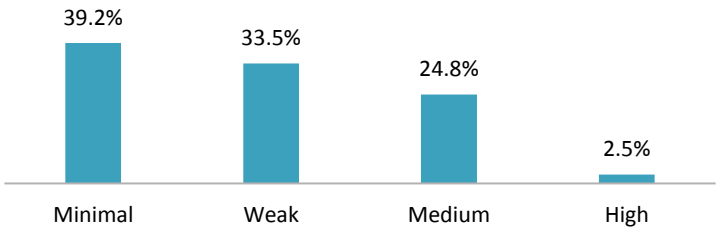
FIGURE 6. SOCIAL NETWORK USAGE BY STUDENTS, %



It is also important to mention that besides the data networks, very popular social networks are Instagram and Telegram.

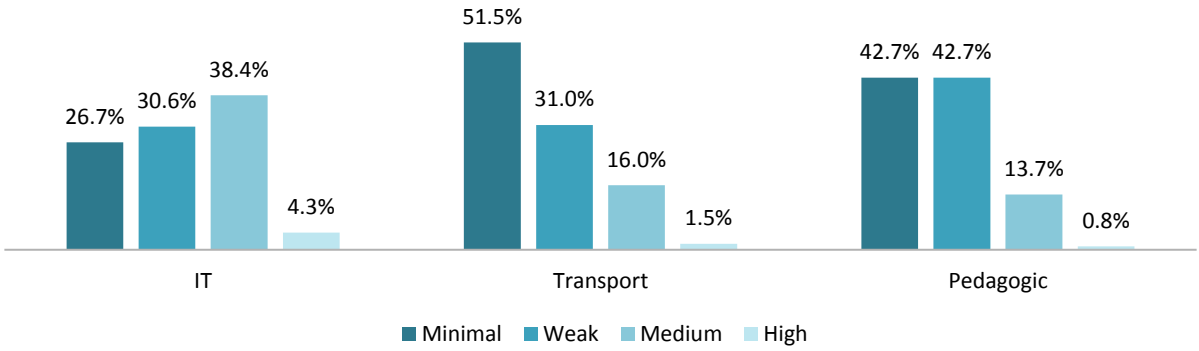
The analysis of the test results shows that a big part of the students in the Technical professional Education have the minimum digital skills. The test results show that nearly 2/5 of the evaluated students (39.2%) got less than 25% of the maximum score, while the share of students who scored more than 75% of the total score is only 2.5%

FIGURE 7. STUDENTS DIGITAL COMPETENCE AT NATIONAL LEVEL, %



As far as the results are concerned, the best ones were obtained by the students from the IT specialties, followed by students at Pedagogy, while the students in the area of transport) had the weakest results, with 51.5% of students in this field demonstrating minimum digital skills.

FIGURE 8. STUDENTS DIGITAL COMPETENCES BASED UPON THE PROFILE OF EDUCATIONAL INSTITUTION, %

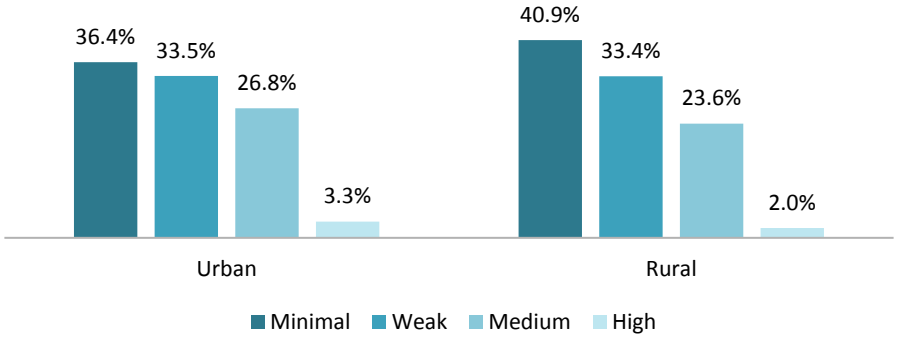


It should be noted that the average value of the accumulated score differs substantially in various area. Thus, in IT field, the average value of the score accumulated by students is 42.1% of the total, while in the Transport and Pedagogical areas there are approximately similar values 27% and 29.2%, which are at the limit between minimal and weak levels.

Another important statement is a high rate of students who failed to accumulate 10% of the maximum score. IT and Pedagogy students had a rate of 15.9% and 15.3%, while students Transport reached 32.5%. Moreover, in the field of Transport (Automotive), the highest rate of students who failed the test with no points -14% test have been noticed. In Pedagogical and IT areas, the situation does not differ much, where 13.7% and 13.4% of the students did not get any points in the test.

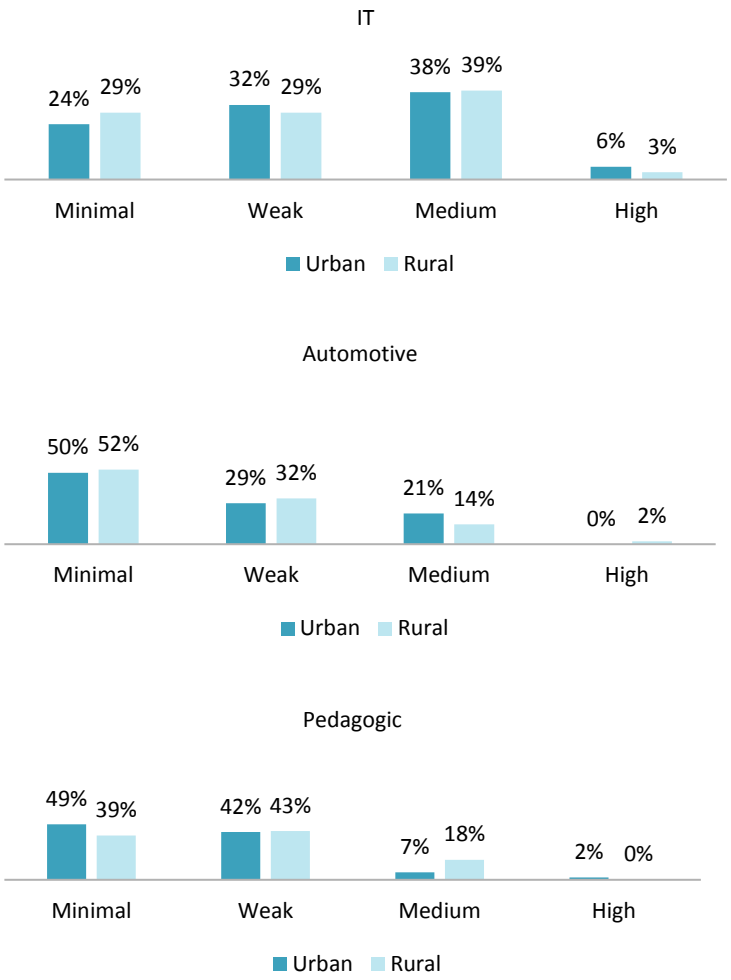
The results were not influenced by the living environment in which the institution was located before being admitted to educational institution. At national level, the differences between rural and urban areas are relatively small, yet with a small advantage in favour of students coming from urban areas. The average score for the students in the urban environment is 35.4% of the total score, compared to 32.8% for those who have graduated from a general education institution in rural areas.

FIGURE 9. STUDENTS DIGITAL COMPETENCES ACCORDING TO LIVING ENVIRONMENT, %



Contrary to the national trend, but also the characteristic of the IT and Transport area (Automotive), in the Pedagogical field students who graduated from the general education institutions in the rural environment registered a significantly higher share of the students coming from the urban environment. Thus, for the Pedagogical field, the rate of urban students who have recorded minimum results is almost 10 percent higher than that of rural students (48.9% vs. 39.2%, respectively). The same trend is also maintained for middle-aged students, where the gap between urban and rural students is even higher and represents 11 percent (17.7% in rural areas and only 6.7% in urban areas).

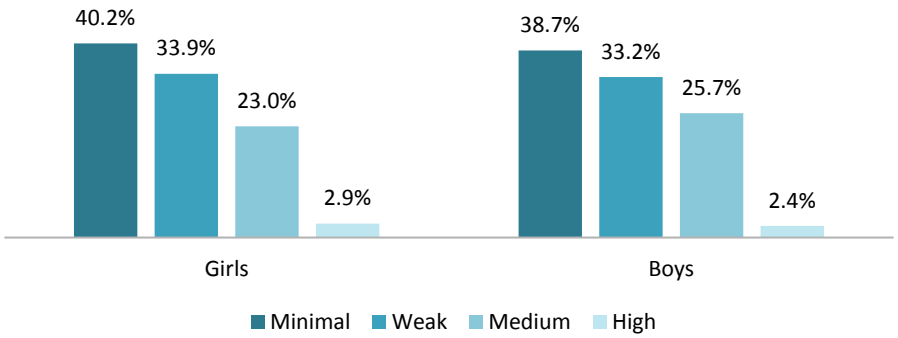
FIGURE 10. STUDENTS' DIGITAL COMPETENCES ACCORDING TO LIVING ENVIRONMENT, %



In terms of gender performance, there are no major differences between boys and girls. The average score for girls is 32.8% of the maximum score, while for boys this value reaches 34.2%

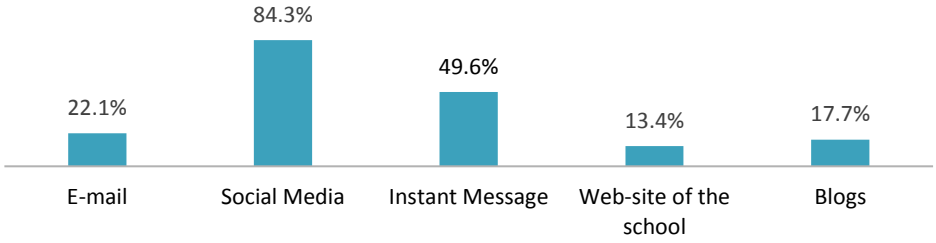
Moreover, there are no major differences in the results of boys and girls as regards the share in a given category of competencies. At national level, the rate of boys with minimal digital competencies is slightly lower than for girls and is 38.7% vs. 40.2% as is the case for girls.

FIGURE 11. STUDENTS' DIGITAL COMPETENSES ACCORDING TO GENDER, %



Regarding the implementation of digital competences in everyday activities, although most students have at least e-learning, these tools are relatively poorly used in student communication. Thus, only 22.1% of respondents indicated they often use this tool for communicating with colleagues.

FIGURE 12. STUDENTS' USING DIGITAL TOOLS IN COMMUNICATION WITH THEIR COLLEAGES, %



On the other hand, the most popular digital tools in student communication is social networking with a share of 84.3%, followed largely by instant messaging, which is used by 49.6%. Other tools are occasionally used by students.

6.1.3. TEST RESULTS ON ABILITY LEVEL

Although the overall results of the evaluation show that only about a quarter of the students in the TVE institutions have medium or high digital competences, the situation is not the same when considering and comparing the results for separate skills and abilities.

The evaluation of students ' digital competences has been tested in three different ways: i) Write a text document and edit it, ii) Create documents for tabular calculations, and iii) Create power point presentation. The results differ substantially depending on the evaluated competence. Thus, the worst result was recorded in the document development competencies for tabular calculations, where the students managed to accumulate on average only 22.9% of the maximum possible score. Much better is the case with text documents and presentations, where the average score is 39.2% and 39.3% of the maximum possible value.

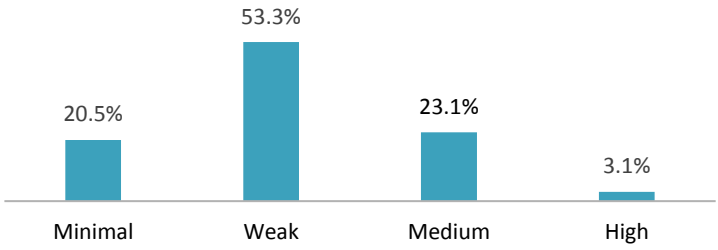
Text Editing

The ability to edit text documents along with those of producing a presentation has recorded the highest average of the scores accumulated at national level. However, the results differ substantially depending on gender, environment, and especially the field of specialization of students. Thus, the best results were registered by the IT specialists, who accumulated an average of 44.7% of the maximum score, being followed by 36% and 34.6% respectively in the field of Transport and Pedagogy and from the maximum possible score.

In the same way, students who graduated from a gymnasium in the urban environment before starting their studies at the TVE' institution recorded a slightly higher average score than those in rural areas - 41% vs. 38%. By gender, on average, boys recorder 6 percentage points more than the girls, registering a 41.4% rate of the maximum score, while the girls scored an average of only 35%.

Regarding the level of competency in text document processing, most of the students (53.3%) have low skills, 20.5% - minimum competences and 5.6% generally failed to accumulate any points.

FIGURE 13. STUDENTS' DIGITAL COMPETENCES IN EDITING TEXT DOCUMENTS, %



In accordance with the Digital Competence Standards for students, the competence of text editing provides the acquirement of abilities including i) elaborate and edit text documents, ii) format characters, pages, iii) structure and format the document, iv) use grammar correction tools and v) insert objects into documents. By analysing students' competency evaluation results, the conclusion is the overwhelming majority of students have only some of the skills needed to edit text documents.

TABEL 13. DIGITAL ABILITIES OF STUDENTS IN EDITING TEXT DOCUMENTS, %

ABILITY	MINIMUM	WEAK	AVERAGE	HIGH
Fonts format	8.7%	12.3%	33.8%	45.1%
Paragraph format	36.9%	19.5%	6.2%	37.4%
Page format	10.8%	10.8%	39.5%	39%
Insert objects into documents	25.6%	27.7%	24.1%	22.6%
Text check	89.7%	7.7%	1.5%	1%

As can be seen from Table 5, there are large discrepancies between students' digital skills in processing text documents. Thus, with regard to elementary tasks such as fonts and Page format, most students have medium or high skills. At the same time, some more complex tasks requiring knowledge that are not in a basic place on the file command bar, such as formatting paragraphs or inserting objects into documents, is a problem for more than half of students.

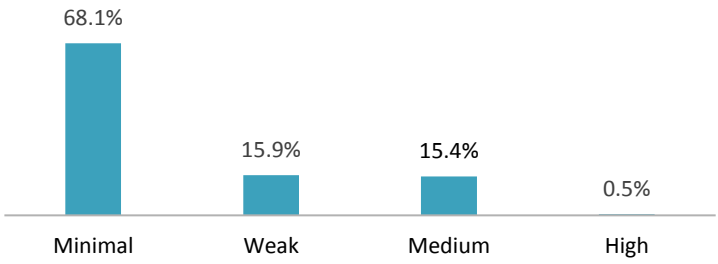
A special situation is the ability to verify texts through the grammar and lexical analyser. The results of the assessment show that the overwhelming majority of students do not have this ability, nor do they know about this possibility of text documents.

Tabular calculation

As mentioned above, the weakest results of the pupils' digital competence assessment were recorded for spreadsheet documents. The average score for this test is 22.9%, and just as with text documents, it differs depending on the environment, gender, and area of study. Thus, the best results were registered by the students in the IT field who obtained an average of 33.1% of the maximum possible score, followed by the Pedagogic area of 18.7% of the maximum possible score. The worst results were recorded by students in transport, with an average of only 12.4% of the maximum possible score.

In terms of competence levels in the field of computerization of national type of compilation documents, the overwhelming majority of students (68.1%) have poor skills and 15.9% have minimal skills. At the same time 23% of the tested students have accumulated 0 points.

FIGURE 14. STUDENTS DIGITAL COMPETENCES IN PROCESSING TABULAR CALCULATION DOCUMENT, %



In this context, in accordance with the Digital Competence Standards of students, the ability to process texts register the following skills i) Elaborate the structure of the spreadsheet, ii) Use formulas and operations, iii) Create and format diagrams, and iv) Verify the text by using grammar and lexical engine. The analysis of competency evaluation results shows that the overwhelming majority of students have only the elementary skills involved in drawing up the structure a spreadsheet.

TABEL 14. DIGITAL ABILITIES OF STUDENTS TO PROCESS SPREADSHEET DOCUMENGTS, %

ABILITY	MINIMUM		WEAK	AVERAGE	HIGH
Elaborate and structure a spreadsheet	25.3%		4.9%	14.8%	54.9%
Use formulas and calculations	79.1%		1.6%	4.9%	14.3%
Create and format diagrams	69.8%		4.4%	7.1%	18.7%
Verify text using grammar and lexical analyser	100%		0%	0%	0%

As the data in Table 6 shows, the unique skill in tabular compilation that is owned by the majority of students is the Elaboration of the spreadsheet structure, especially the creating a table and the using text-writing skills.

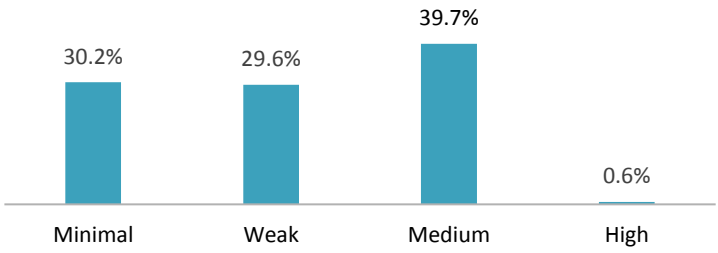
If the task is more complex, it requires specific knowledge or operations that are not located in the basic command bar, such as use functions, address cells, or create and format charts is a problem for the biggest number of students.

Presentations

The competences of drafting and formats of presentations recorded the highest average of national scores. As with previous examples, the results differ substantially depending on the students' field of study. The highest average is registered for the IT field where the average score of students is 48.4%. The other domains recorded much weaker results - in the Pedagogical field the accumulated average score is 34.8% of the maximum score, and in the case of Transports the average rate of the accumulated score is 31.4% of the total.

As far as gender analysis is concerned, in the case of presentations it is found that girls achieved a better result than boys, averaging 41.8% of the maximum score compared to 38% for boys. The field of presentations is the only one in which such a situation occurs, in the case of text documents and spreadsheets boys score better results than girls.

FIGURE 15. STUDENTS DIGITAL COMPETENCES IN ELABORATING PRESENTATION, %



Regarding levels of competence in making presentation at national level, most of the students have average competencies (39.7%), and only 59.8% have minimal or weak competencies, which is the lowest result among the evaluated types of competencies.

As far as the concrete skills necessary for making presentation, the following skills have been tested: i) insert and edit text boxes, ii) insert and edit images, iii) insert objects in documents, iv) elaborate presentation , v) Verify the text by using the grammar and lexical analyser.

TABEL 15. STUDEDENTS DIGITAL ABILITIES IN ELABORATING AND EDITING PREZENTATIONS, %

ABILITY	MINIMUM	WEAK	AVERAGE	HIGH
Insert and edit text boxes	14.0%	1.7%	3.9%	80.4%
Insert and edit images	32.4%	2.8%	19.0%	45.8%
Insert objects in documents	47.5%	4.5%	47.5%	0.6%
Draft presentations	40.8%	20.7%	15.6%	22.9%
Verify text using grammar and lexical analyser	98.3%	1.7%	0%	0%

Analysing students outcomes according to skills, it has been concluded that a large number of students have average and high skills for most of the key abilities needed to prepare a presentation. However, there is a number of irregularities difficult to explain. Thus, in the ability to develop presentations that include activities such as using slide models, presentations and animation, one can see the tendency of two large groups of students, one of which includes student with minimal skills and the other with average competencies 47.5% in both cases), while the rate of low and high skills is extremely low - 4.5% and 0.6%, respectively.

Another tendency characteristic for all types of evaluations - text, spreadsheet, presentations - represents the extremely high rate of students with minimal competencies in Verify Text by using spell check and thesaurus. This can be explained by the complexity of the task, but also by the technical specifications of the technique in which the test was made. In some cases, it is impossible to apply text verification caused by lack of that software.

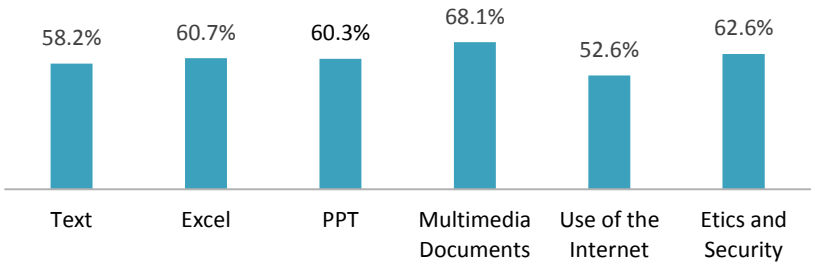
6.1.4. DIRECTIONS IN DEVELOPMENT OF DIGITAL COMPETENCES

The test results indicate that most students have minimal or weak digital skills in the areas of word editing, spreadsheet and presentations, and the ratio of those with high digital literacy does not, in the best cases, exceed 3%. At the same time, the active use of social networks and e-mail means that at least some skills are average in using Internet and communication in virtual environment are average.

Very bad results are confirmed also students' personal perceptions. Most students feel that they need to some extent to increase the level of digital competences in word processing, spreadsheet and electronic

presentations. Also, most students consider that they need the development of digital competences in the field of multimedia document production, as well as Internet ethics and security.

FIGURE 16. STUDENTS PERCEPTION IN AREAS WHERE THEY NEED ADDITIONAL KNOWLEDGE FOM AVERAGE TO HIGH, %



However, there is a lack of objective perception and prioritization by students over their competencies. Although the overwhelming majority of students do not have the minimum competencies in basic areas such as table-top document editing, and 23% have failed to gain any point in testing, only 16.7% of students feel they need in ongoing study in this area.

Another important outcome is the increased interest of students in the development of digital competences related to using Internet. Although nearly 100% of students have computers, are registered in social network accounts and use e-mail, more than half of those surveyed think they need average knowledge (26.1%) or high (26.4%) in development Internet skills. This shows that although students have access to computer technology and use virtual communication tools on a large scale, they do not have the necessary skills to use Internet widely to get benefits in learning and developing professional skills, being limited to basic functions like daily communication.

6.2. ICT USAGE IN TEACHING-LEARNING-EVALUATING PROCESS

6.2.1. ANALYSIS OF THE REGULATORY FRAMEWORK RELATED TO DIGITAL COMPETENCES DEVELOPMENT IN TEACHING-LEARNING-EVALUATING PROCESS

The development of digital competences in Technical Vocational Education, at all levels of general education, is being performed first of all, during the Information and Communication Technology course.

Information and Communication Technologies courses are based on the curriculum approved by Directive 662/2016O of the Ministry of Education. The curriculum has the mission to train and develop competencies specific to the area of information and communication technology, but also to develop general professional skills according to the professional qualification.

Modular Curriculum for Technical Vocational Education in Information Technology and Communications aims to develop skills and abilities similar to those that have been evaluated during the evaluation conducted within this survey.

TABLE 16. STRUCTURE OF DIGITAL COMPETENCES STIPULATED IN THE CURRICULUM TO BE APPLIED IN ICT COURSES IN TECHNICAL PROFESSIONAL EDUCATATION

N / A	MODULE	TOTAL HOURS	THEORY	PRACICTE	INDIVIDUAL WORK
1	**Use operating systems**	64	16	16	32
2	**Use peripheral equipment**	32	10	12	10
3	**Text edit**	40	8	14	18

N / A	MODULE	TOTAL HOURS	THEORY	PRACICTE	INDIVIDUAL WORK
4	**Tabular calculation**	80	13	31	36
5	**Multimedia technologies**	60	10	20	30
6	**Communication technologies**	60	15	15	30

As can be seen in Table 8, the development of digital competences that have been tested was allocated 180 hours out of which 31 theoretical and 65 practical, mostly taking into account the complexity of this matter, were allocated to the Study of the Tabular Calculation. However, in the case of the Tabular Score, the worst results were recorded and 23% of the evaluated students failed to accumulate any points in the test.

At the same time, the analysis of the courses organized by the Centre for Information and Communication Technologies in Education (CICTE) for teachers and managers shows that the average number of hours intended to obtain text editing skills, spreadsheets and presentations is 30 hours per course[15] except for individual working hours. Thus, it is clear that the number of hours for teachers to acquire skills is either similar (in the case of Presentation Drawing), or slightly less than the number of hours provided for students in TVET.

Moreover, international practice shows that less hours than the number of hours stipulated in the curriculum are needed to acquire digital text editing, spreadsheet and presentation skills. In the case of the Tabular Calculation, the average duration of similar courses is approx. 18 hours[16], for Text editing - 14 hours[17] , and in the Presentations - 16 hours[18] (NB: the number of hours was calculated based on the formula - Duration of the course x 2 – practical exercises multiplier).

Considering the above mentioned, it can be seen that the number of hours provided by the Curriculum for Information and Communication Technology is sufficient for the development of students' digital competences to the extent that they correspond to the standards approved by the Ministry of Education.

6.2.2. DIGITAL COMPETENCES OF TEACHERS

Digital competence standards for teachers in general education were approved by Directive 862/2015 of the Ministry of Education. The standards stipulate seven areas of digital competence divided into three levels. The detailed analysis of the Standards is described in Chapter 5.1 of this report.

However, applying digital competences in the teaching-learning-evaluating process is not an important element in the process of internal evaluation of teachers in technical vocational education (see Chapter 5.1 - Self-Evaluation Guide for Internal Quality insurance in Technical Vocational Education institutions in the Republic of Moldova) and, in the case of professional accreditation, this element is generally missing.

In order to evaluate the teachers' digital competences, as well as to assess their application in the teaching-learning process, questionnaires were applied to the teachers and students in TVE. In total, 605 questionnaires were conducted among students and 450 questionnaires among teachers.

[15] http://ctice.md/ctice2013/?page_id=296

[16] https://www.coursera.org/learn/excel-essentials, https://www.udemy.com/the-quest-for-excel-lence/,https://www.udemy.com/excel-tutorial/

[17] https://www.udemy.com/course/microsoft-word-from-beginner-to-advanced-and-beyond/, https://www.udemy.com/microsoft-word-from-beginner-to-advanced/

[18] https://www.udemy.com/case-study-powerpoint-2013-presentation-slide-by-slide/, https://www.udemy.com/powerpoint-master-class-for-business-and-finance-graduates/

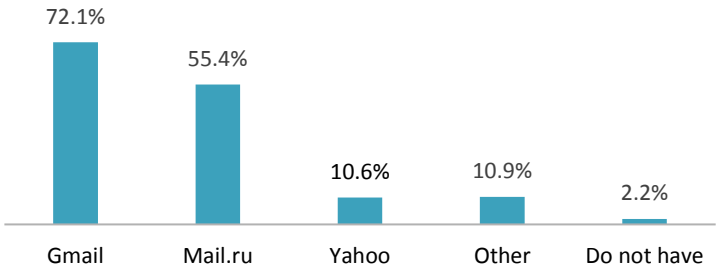
The analysis of the questionnaires shows that the overwhelming majority of teachers are digitally literate, they have at least one personal computer, an e-mail address and registered in social network, and have the opportunity to work after hours at the computers of the institution they work in.

The answers show that 95.2% of the surveyed teachers have at least one computer in their possession. Most of the teachers have a laptop - 70.2% of teacher would prefer desktop computers - 55.1% and 11.5% have at least one tablet.

On the other hand, it is noted that big number of teachers have at least 2 computers - 31.6% of teachers, and 6.1% have three electronic gadgets.

In terms of e-mail addresses, the number of teachers having an e-mail address is approx. 97.8%. Moreover, a large number of teachers have 2 electronic addresses - 7.9%, and 38.8% in general have 3 and more electronic addresses.

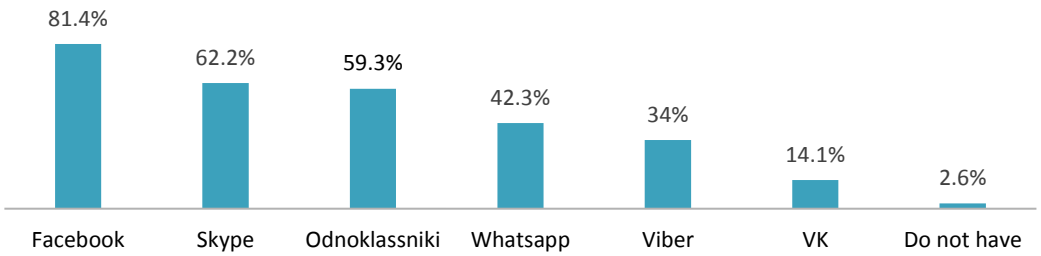
FIGURE 17. STRUCTURE OF TEACHERS ACCOUNTS ON E-MAIL, BY EXTENSION,%



Most teachers (72.1%) have an e-mail address with the gmail.com extension, and more than half have a mail on the mail.ru server. The most popular combination of e-mail addresses among teachers is that of two electronic addresses, one with the extension gmail.com and the other with the extension mail.ru. Such a solution is preferred by 30.7% of the teachers, 27.8% of teachers have only one e-mail address with the extension gmail.com, and 18.2% have an e-mail address with the extension mail.ru.

In social networks, the situation is almost similar to e-mail addresses, and 97.4% of all teachers are registered in at least on social network. Moreover, nearly 2/3 (63.8%) of teachers have accounts on 4 or more social networks and only 7.9% have a personal account on a single social network.

FIGURE 18. STRUCTURE OF ELECTRONIC ADDRESSES OF TEACHERS BY EXTENSION,%

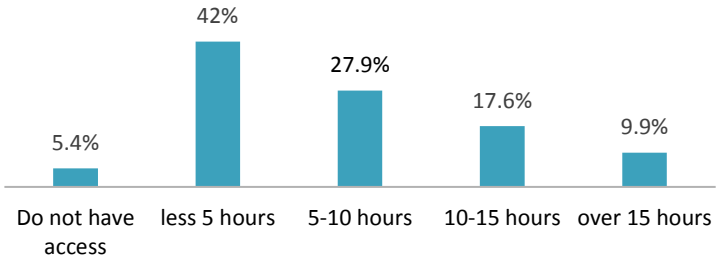


In terms of teacher preferences, the most popular social network is Facebook, approximately 81.4% of teachers have an account on Facebook. The most popular social networking combinations used by teachers are Facebook, Skype, Odnolkassniki, WhatsApp, and 12.5% of all network teachers and Facebook, Skype, Odnolkassniki, WhatsApp and Viber - 12.5% . Another popular combination is made up of Facebook and Viber which is 8.8%.

The results of the questionnaire reveal that most of the teachers - 94.6% - have the opportunity to work after hours at the computers of the educational institution they work in. On average, teachers have the ability to work on the computers of the institution 6.2 hours per week, which represents an average of 2 academic lessons per day.

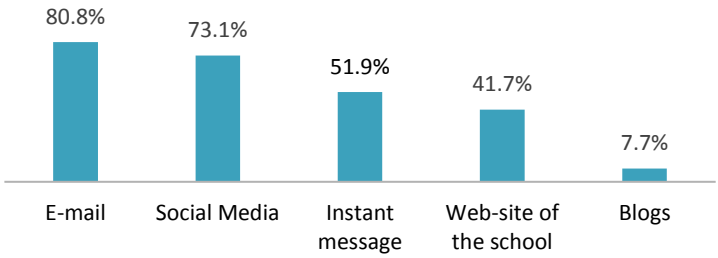
The majority of teachers have access to the computers of the institution less than 5 hours a week, and approximately 28% of teachers can access the computers of the institution between 5 and 10 hours per week. Only about a quarter of the teachers have access to the computers of the institution for more than 10 hours a week.

FIGURE 19. STRUCTURE OF WEEKLY ACCESS OF TEACHERS TO COMPUTERS OF THE INSTITUTIONS THEY WORK IN, %



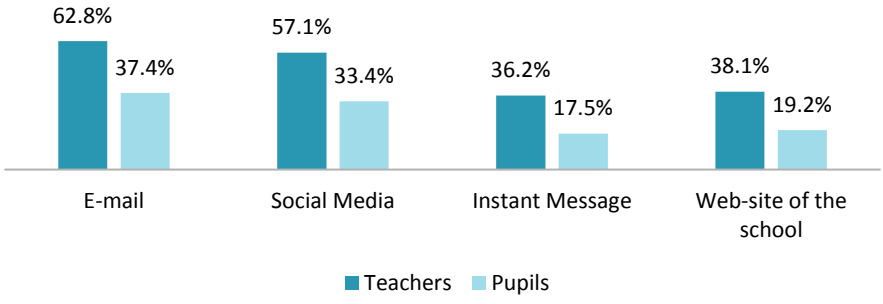
Regarding the application of digital competences to everyday and professional activity, such as communication with students or colleagues, it is noted that the most popular digital communication tools between teachers is still e-mail. According to the results of the questionnaire, about 81% of the respondents indicated that they frequently use this tool often to communicate with their colleagues.

FIGURE 20. STRUCTURE IN USING DIGITAL TOOLS BY TEACHERS IN COMMUNICATION WITH COLLEAGUES, %



An unusual situation occurs when using digital tools by teachers in communicating with students. This reveals a major discrepancy between the teachers' position regarding the data on the frequency of use of the respective digital tools and the opinion of the students. In most cases there is a nearly 100% gap between the dates indicated by teachers and those provided by students.

FIGURE 21. STRUCTURE OF USING DIGITAL TOOLS BY TEACHERS IN COMMUNICATION WITH STUDENTS, SURVEY OF TEACHERS AND STUDENTS, %



Another interesting thing is the number of teachers using on-line document sharing tool. Although 74% of students and 72.1% of teachers said they had at least one e-mail address with the extension gmail.com, and 30% of teachers said they use the document sharing tool to communicate with their students.

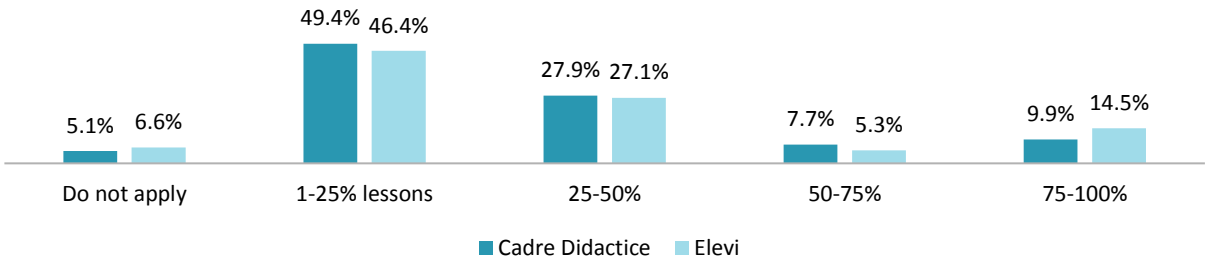
6.2.3. USAGE OF ICT IN THE TEACHING PROCESS

The teaching process is one of the most important elements of the educational process. The way in which the teaching process is organized depends to a large extent on the final success of the students. As a result, the usage of ICT in the teaching process can significantly contribute to the quality and effectiveness of the educational process in general. Thus, applying information and communication technologies at the European level has become an indispensable element of the educational process[19]

In the case of TVE in Moldova, applying digital tools in the teaching process is a normal practice used by a big number of teachers. However, the tools used by TVET teachers are usually the most simple.

The results of Applied Teachers' Questionnaire reveal the absolute majority of teachers using digital tools in the teaching process to less than half of the hours they are conducting, and about 5% do not generally apply digital tools in the teaching process.

FIGUEA 22 TEACHERS USING DIGITAL TOOLS IN THE TEACHING PROCESS, SERVEY CONDUCTED AMONG TEACHERS VS STUDENTS, %

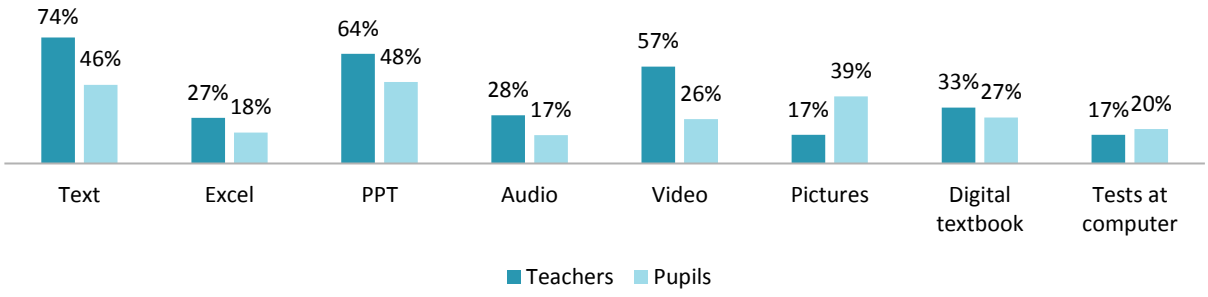


The results of the teachers' questionnaire are confirmed by the results of the questionnaires among students. Thus, according to students opinion, 6.6% of the teachers do not use digital tools in the teaching process, over 2/3 of the teachers (73.5%) apply digital tools in the teaching process less than 3-4 times per week.

Regarding the concrete tools used by teachers in the teaching process, the most popular digital tools used by teachers in the teaching process are text documents and presentations. Almost ¾ of the teachers often use text documents in the teaching process, while 17% use that sometimes, and only about 6% do not use this type of digital tools at all.

Teachers 'preferences in using digital tools are also confirmed by students' answers. Thus, almost half (46%) of students confirm that teachers often use text documents during lessons in the class, and 42.5% say that teachers use this kind of tools from time to time.

FIGURE 23. RATE OF FRQUENT USAGE OF DIGITAL TOOLS BY TEACHERS DURING THE TEACHING PROCESS, SURVEY MADE AMOUNG TEACHERS VS STUDENTS, %



[19] https://ec.europa.eu/digital-single-market/en/policies/digital-learning-ict-education

The information from questionnaires is also largely confirmed by the information provided by the Teachers in Target Groups. Thus, the most used digital tools applied by teachers are electronic presentations, as well as video and audio tools.

Women, CEITI Teacher, 21 Years of Experience – "Wherever *I can always use PowerPoint presentations. If there are some movies, it's obviously easier, I've noticed lately*. "

Mariana - " *I use Power Point, where I can put some schemes, pictures; e-mail, of course; social networks, because not all of them use e-mail, and it is easier for them through social networks to assimilate required information, all this in cooperation with students* "

Tatiana, SP 5 Bălţi, professor, speciality auto-electronics - " *I also use Power Point, computer. Also I use video quite often. I see more and choose one that better describes the functionality of a system or something else. Likewise, I use schemes, pictures* "

Female, Professor Biology, SP Stefan Voda - *"Google, PowerPoint, YouTube"*

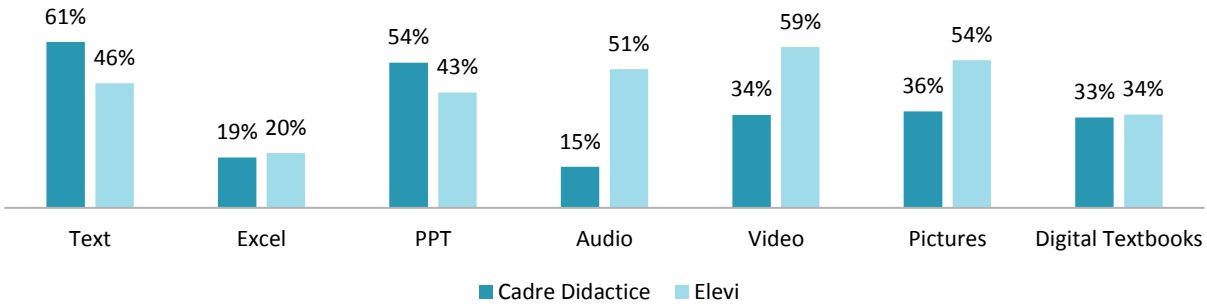
The results of questioning teachers and students, as well as the information provided by teachers in target groups overlapped the test results. This means that worst results obtained by students are in the case when of the least used tools, and by teachers in the teaching process. It cannot be assured that the low rate of teachers use spreadsheet during the teaching process greatly influenced the students' competencies in this field, but this fact cannot be neglected and should be taken into account when planning the classes.

6.2.4. ICT USAGE IN LEARNING PROCESS

Individual learning or otherwise, individual work is a very important element in the general learning process. Individual work in national curriculum is allocated, approximately, the same number of hours as work in class. In this context, individual work has an important role to play in developing competences and skills, including ICT.

The analysis of teachers and students questionnaires show that there is some inconsistency between the opinion of teachers 'and students' regarding the usage of digital tools during the learning process. Most teachers therefore require students to use text documents (61.2%) and electronic presentations (53.5%), while students often use video and digital images - 59.3% and 54.4% respectively. At the same time, text documents and electronic presentations are often used by students in individual education only at 46% and 42.5% respectively.

FIGURE 24. RATE OF USING DIGITAL TOOLS IN THE TEACHING PROCESS, TEACHERS VS STUDENTS, %



As seen Figure 17, students in learning process prefer interactive tools such as audio, video spots, and images, while teachers continue to insist on the set of outdated tools such as word edited documents and presentations.

Another ´conclusion, which largely confirms the results of the previous chapter, consists in the low use of table-type documents, both by students and teachers that do not require students to use this tool.

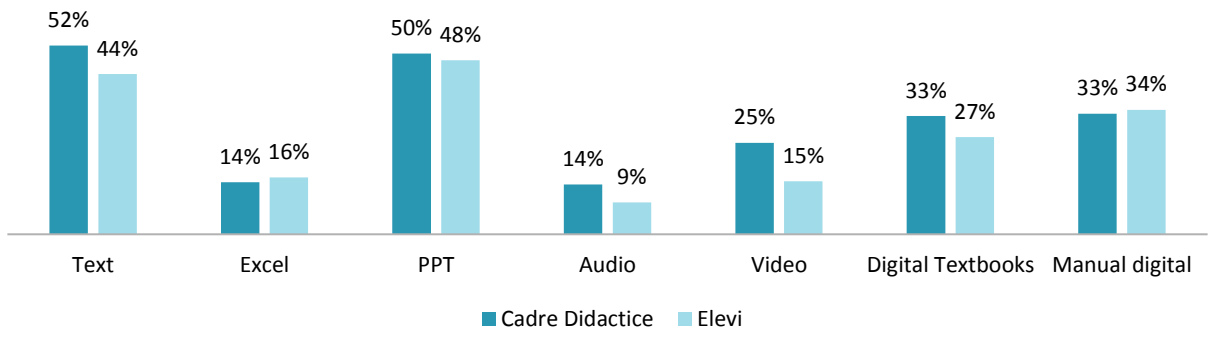
6.2.5. ICT USAGE IN EVALUATION PROCESS

The evaluation process is a complex psycho-pedagogical action based on measurement and evaluation of the educational results and aims to objectively evaluate students' learning outcomes, having a very important role in motivating and supporting the ongoing process of learning for students. At the same time, evaluation also has the role of assessing the level of the students' competencies in the view of adjusting and optimizing the teaching process.

The use of ICT tools in the evaluation process is aimed both at optimizing the process and increasing objectivity, on the other hand, developing digital skills among pupils and developing the skills of using digital tools in everyday work to achieve concrete tasks.

The data of the questionnaires, the one completed by the teachers as well as the one completed by the students, show similar results. Textbooks and electronic presentations are the most popular digital evaluation tools, 52.2% of teachers and 44.3% of students assert that teachers often use text documents in the evaluation, and 50% of teachers and 48.1% of students often use electronic presentations.

FIGURE 25. RATE OF USAGE DIGITAL TOOLS BY TEACHERS IN THE EVALUATION PROCESS, TEACHERS VS STUDENTS, %



The other digital tools have a small number of teachers' preferences when it comes to the evaluation process. Thus, another popular tool in the digital image, which is often used by 32.7% of teachers, as confirmed by 26.9% of students who say that teachers use this digital tool.

Another traditional observation, consists of low rate (the lowest except for the Audio tool) in using tabular calculations. This tool is not widely used in any of the basic educational processes. As a result, the skills of using the spreadsheet calculation without the application of the given tool within the daily educational processes, result in forgetting the skills developed during the computer classes, and ultimately manifest itself by lowering the students' skills to create files and use the given tool in the school and everyday activity.

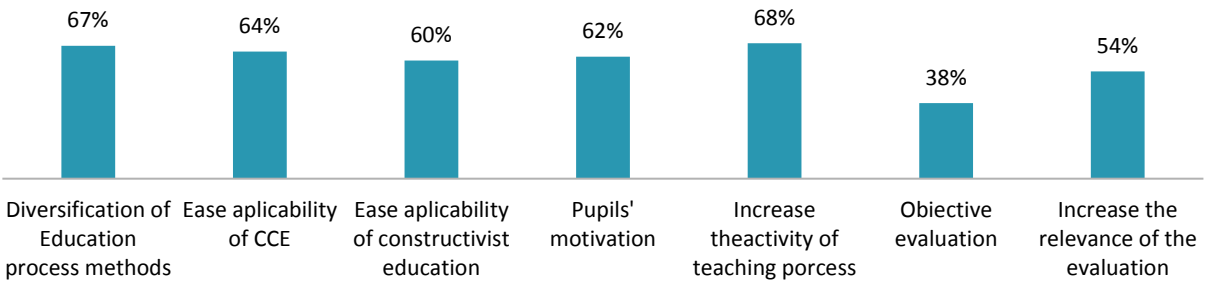
6.2.6. ICT ROLE IN TEACHING PROCESS

The analysis of the application of ICT tools in the Teaching-Learning process has shown that most teachers use ICT tools in less than half an hour, and the most popular tools are text documents and electronic presentations.

However, both teachers and students believe that the use of ICT in the process plays a constructive role that helps to facilitate learning and increase the objectivity of the evaluation.

Thus, the absolute majority of teachers (67%) consider that the application of ICT in the TLE process contributes to the diversification of the courses and increases the learning capacity of students, which is confirmed by the majority (56%) of the students.

FIGURE 26. TEACHERS' OPINION ON THE USAGE OF ICT TOOLS OVER THE PIE PROCESS, TOTALLY AGREE, %

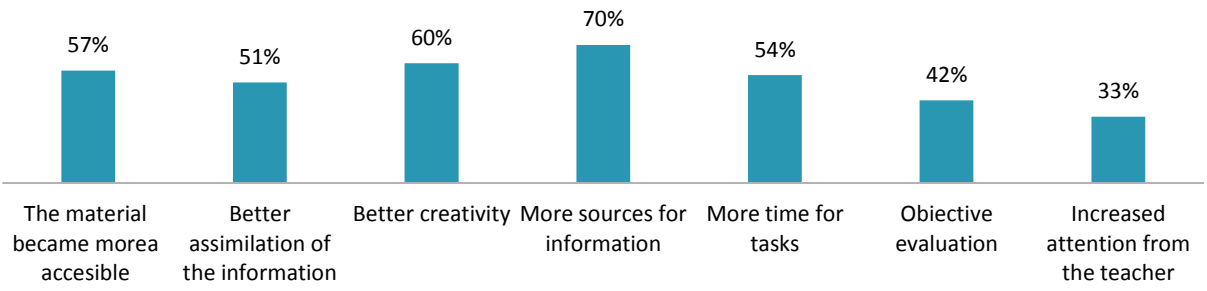


In this respect, it has been concluded that the application of ICT in the educational process makes it easier for the teachers to apply in practice the principles of Centralized Education, 64.1% of teachers being convinced that through the application of ICT tools they are more successful in providing the necessary material to each student, based upon their needs and competencies. However, due to insufficient or incorrect application, this is not the same for students, only 33.4% of students consider that the use of ICT tools allow teachers to give them more attention in the teaching process.

As far as the learning process is concerned, the majority of teachers (59.6%) believe that by using ICT tools, learning constructive methods are easier to achieve. As a result, students are saying that using ICT tools can more easily assimilate information, which helps to learn faster, leaving them allocate more time to more difficult topics (54.4%).

Although the application of ICT tools implies an increase in objectivity due to elimination of human factor in the evaluation process, only 38.1% of the teachers and 41.7% of the pupils totally agree with this theory.

FIGURE 27. STUDENTS' OPINION ON THE IMPACT OF USING ICT TOOLS IN TEACHING PROCESS, TOTALLY AGREE, %



Referring to risks of ICT tools implementation, it is clear that students have a more optimistic perception of the impact of ICT than the teachers. The majority of teachers believe that the use of ICT tools increase the risk of electronic copying (37.8%), as well as the replacement of practical activities with the key user (52.9%). On the other hand, only 19.3% of students believe that the use of ICT tools makes them spend time on computer, disadvantaging speciality practice.

As far as the development of interpersonal relationships and communication is concerned, only 24.7% of teachers believe that the application of ICTs does not result in discrimination teaching process, while most students believe that ICT help interacting more easily with team members (52.2%).

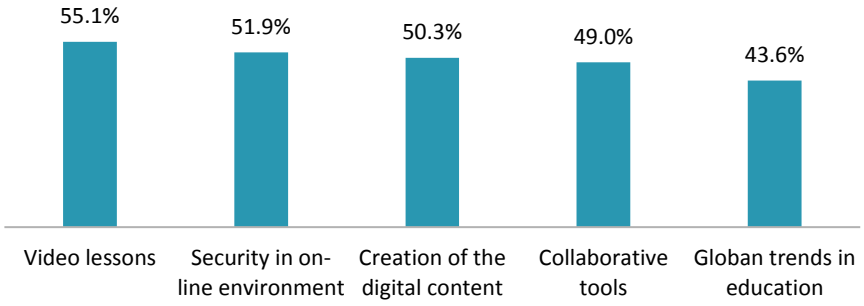
6.2.7. ONGOING TRAINING FOR TEACHERS IN ICT

Ongoing teacher education is a key element in ensuring quality in the educational process. The principle of continuous teacher education is stipulated in the Education Code (art.127). The National Agency for Quality Insurance in Education and Research (ANACIP) is responsible for the state policies in in providing qualitative technical vocational education and ongoing training. The evaluation of the ongoing training activities is provided by the Regulation evaluating teachers in the general, technical and psychological education.

However, as mentioned in Chapter 5.2, current regulations do not motivate teacher training in ICT, and the score methodology of quantification, accumulation and recognition of professional credits do not provide any benefits for teachers who support ICT trainings.

On the other hand, the analysis of teachers' digital competences expresses an existence of basic digital competences that put into application the most basic ICT tools such as Text documents, electronic presentations and video spots in the IEP process. The level of digital competences of teachers is indirectly confirmed by the preferences of ICT teachers getting additional training. Analysis of teachers' questionnaires shows an increased interest in that.

FIGURE 28. TOP 5 THE MOST POPULAT COMPETENCES, WHERE TEACHERS WOULD LIKE AN ADDITIONAL TRAINING, %

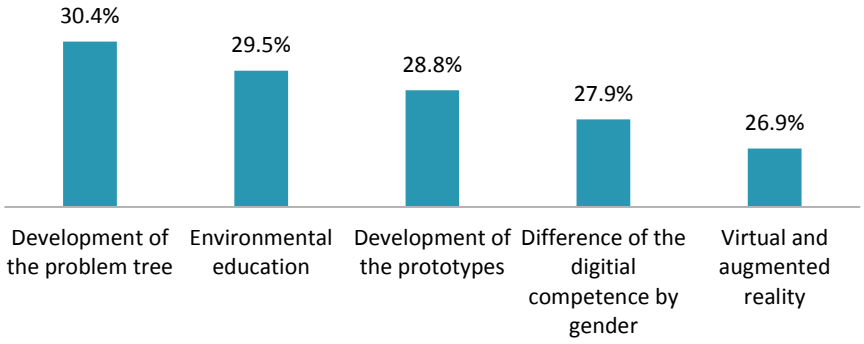


Tools like Video Lessons and Digital Content Creation, and less interest in complex elements such as Prototype Development, Artificial Intelligence, or Data Analysis and Visualization.

The most popular areas of Information and Communication Technologies where teachers would like additional training are Video Lessons, Cooperation tools and Online Security, each supported by over 50% of respondents

Opposite the interests of teachers' preferences, are complex areas such as Virtual Reality (26.9%, Prototype Development (28.8%) or those in cross-sectional areas such as the Gender Deviation (27.9%) and Environmental Education (29.5%)

FIGURE 29. TOP 5 MOST UNINTERESTED SKILLS FOR ONGOING TRAINNING BY TEACHERS, %



Regarding the priorities in ongoing teacher education by areas of digital literacy and innovative teaching methods, the results differ from one competence to another, without existence an area of special interest for teachers.

The most popular field remains the application of cooperation tools, with 49% of teachers wish more training in this area. The second place in the top of the teachers 'preferences is the field of Communication and Creativity with a support of 43.6% of the respondents, and a competence in this area is generally in the top of teachers' preferences with a result of 50.3% of the total number of respondents.

With respect to the application of complex tools such as those included in the area of Creating and integrating digital content, there is an increased interest in activities that do not require the development of complex and specialized digital skills like Video Lessons (55.1%). At the same time, complex activities such as Virtual Reality and augmented reality are not seen by teachers as a priority in their ongoing training.

Another area of teachers' interest from the perspective of ongoing training related to cross curriculum aspects, two of the three competences included in the 5 less interesting skills for the teachers in view of receiving additional things.

An unexpected result for a survey among teaching in the technical professional area is extremely low interest in additional training in Critical Thinking and Problem Solving. Starting from the importance for technical specialties of experimenting and developing prototypes, it is noted that the development of these competences is not a priority for the teachers, and 2 of them could be listed in Top 5 the least interesting skills for teachers for getting additional training.

TABLE 17.TEACHERS INTEREST IN DIGITAL KNOWLEDGE AND INNOVATIVE TEACHING METHODS %

DOMAIN / SUBJECT	RATE OF INTEREST IN ADDITIONAL TRAINING
The Future of Education	**39.9%**
Legal and strategic framework in the field of education	36.9%
General Principles of 21st Century Education	39.1%
Global Trends in Education	43.6%
Cooperation	**49%**
Cooperation Tools	49%
Communication and creativity	**43.6**
Slang and IT vocabulary	50.3%
Create digital content	36.9%
Critical Thinking and Problem Solving	**33.3%**
The culture of experimenting	34.6%
Develop prototypes	28.8%
Elaborate of core problem	30.4%
Test and provide feedback	40.4%
Create and integrate digital content	**38.8%**
Analyse and view data	38.1%
Gamification	41.0%
Artificial Intelligence	32.7%
Video lessons	55.1%
Virtual reality	26.9%
Security in on-line environment	**44.3%**
Ethics in online environment	38.8%
Management in classroom	42.3%
Security in the on-line environment	51.9%
Cross-cutting issues	**30.1%**

DOMAIN / SUBJECT	RATE OF INTEREST IN ADDITIONAL TRAINING
The digital skills gap in terms of gender	27.9%
Environmental education	29.5%
Intercultural education	33.0%

6.3. INFRASTRUCTURE AND EQUIPENT

At European level, the field of ICT infrastructure and equipment in both high school and technical vocational education (VET) schools is guided by the conceptual model developed by the European Commission in the framework of the HECC (High Equipped and Related Classroom)) [6] This model provides 3 steps in integrating ICT into the infrastructure of a classroom, namely:

- ✓ The Inception Level of HECC. It involves a minimum basic set (hereinafter referred to as reference set) of ICT equipment, networks and content (software) that needs to be integrated in education institutions. The Reference Set operates with the following indicators - minimum 1 computer (desktop or laptop) for 3 students. It is necessary to have at least one interactive table, at least one microcontroller for programming exercises, and software to produce text content (for example, the Microsoft Office Package). At the Internet connection level, the minimum standard means an internet-accessible network for the entire institution (WLAN). Moreover, the minimum set of tools includes a set of educational materials for ICT teachers and students for their integration in the study process, including access to online courses, webinars, resources and online learning networks for teachers, as well as software- educational materials, online learning materials and educational games for students.
- ✓ The advanced level of HECC integrates all the core infrastructure with the following add-ons: interactive spreadsheets and projectors available in all classrooms, integration of cloud operations into access and use of ICT materials, 3D modelling machines and software, classroom management systems studies, a network for the entire institution, access to online communities for the exchange of experiences and practices for teachers. In the content for students, advanced HECC level includes online educational kits, educational mobile applications, electronic books (e.g.: kindle), virtual online laboratories.
- ✓ The advances HECC level (cutting edge level)proved access each student should have to individual computer (1: 1 student / computer rate), the rate of electronic books (ex. Kindle) for each student should be 1: 1, virtual reality sets for each student (VR), voice assisting devices (ex. Siri, Alexa) and smart electronic watches, editing video software, high speed internet connection etc. Regarding access to materials for teachers, the advanced level should emphasize ongoing access of teachers to all resources / courses / training. Students should have access to program diversification, online materials and ICT resources for integration into the study curriculum for each subject.

According to the survey "2 ND Survey of Schools: ICT in Education" about 72% of schools meet the inception HECC requirements on digital upgrade of education classrooms at the European level. The Republic of Moldova, on the other hand, is guiding the ICT provision of the Technical Vocational Education Institutions on the basis of the "Minimum ICT Endowment Standards of the Technical Vocational Education Institutions" approved by the Ministry of Education through Directive 1043 as of 29 October 2015. It stipulates a set of minimum standards in terms of equipment, and a set of statistical data:

- ✓ 20 students per 1 computer
- ✓ Maximum 50% of computers older in years
- ✓ Minimum 25 computers per institution (15 computer in science classrooms + 10 in administration office)
- ✓ 3 Computers for Drivers
- ✓ 4 Computers used by teachers used in the teaching process

- ✓ 2 computers in the method department
- ✓ 1 computer in the Library
- ✓ Minimum 2 printers per institution
- ✓ Minimum 1 projector per VET
- ✓ Minimum 1 projection tab

The Ministerial Directive also contains a reference to IT institutions, which states that minimum equipment and infrastructure standards will be provided to each institution separately to accommodate curriculum requirements.

Furthermore, the survey analysed the infrastructure and equipment facilities by observation sheet through which or data was collected on compliance with minimum set of endowment, as well as a set of indicators similar to those stipulated at European level in HECC. Equally more qualitative data on technical and software endowments were collected through teacher interviews and questionnaires. This allows de facto and a comparative analysis of the technical equipment results, more so as to provide a measurable perspective on the necessary development direction of infrastructure and equipment endowments. Taking into account that the analysed institutions are from three distinct areas (Transport, Education and IT), the comparative analysis will be presented both as a cumulative result for all training process, as well as separate results per each area separately.

TABLE 18. COMPARATIVE ANALYSIS OF STANDARDS FOR ICT EQUIPMENT ENDOWMENT: STANDARD IN THE REPUBLIC OF MOLDOVA, STANDARD IN THE EU, TVE INSTITUIONS REALITY %

INDICATOR	AVERAGE TVE INSTITUTIONS	MINIMUM STANDARDS IN THE REPUBLIC OF MOLDOVA	EUROPEAN HECC & AVERAGE STANDARDS
Rate of Students per Computer	8: 1	20: 1	3: 1
Nr. minimum computers	+	25	N / A
Nr. of Computer for Students	Meeting in all institutions except 1	15	N / A
Nr. of Computers for Teachers	+	4	N / A
Nr. of Computers for Drivers	Meet in all cases except in an institution	3	N / A
Nr. of Computers designed for administrative staff	+	2	N / A
Networks and servers	Only 35% of institutions have a server and only one institution has more than one server	N / A	Schools must have a local network / servers accessible at each institution
Nr of computers connected to Internet	82%	N / A	All computers and IT equipment must have an Internet connection
The local WI-FI area	41%	N / A	All computers and IT equipment must have an Internet connection
Internet connection speed	91 MB / s	N / A	Media 30-100 mb / s

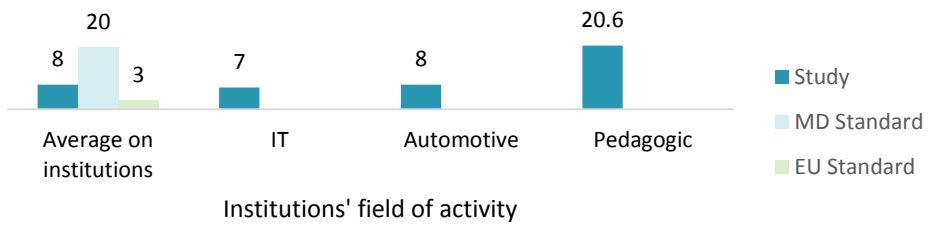
INDICATOR	AVERAGE TVE INSTITUTIONS	MINIMUM STANDARDS IN THE REPUBLIC OF MOLDOVA	EUROPEAN HECC & AVERAGE STANDARDS
Number of Digital Multimedia Projectors	The national standard is completed. An average of 9 projectors per institution. Two institutions have two projectors and an institution has 22 projectors	1	N / A
Total number of interactive boards	Only two institutions out of 13 do not have at least an interactive board. In comparison with the European standards, the average number of students per interactive board in the Republic of Moldova is 645: 1	1 per institution	European average 166: 3
Supporting programs facilities	From a huge range of supporting programs, only two institutions reported about keypad and mouse adapting programs	N / A	N / A
Educational Digital Content Development Programs	Only 33.3% of the institutions reported on frequents use of digital content development programs	N / A	Use by each student at least a few times a month or even more often
Programs for the development / use of electronic tests	59% of the institutions reported on the regular use of e-testing programs	N / A	Use by each student at least a few times a month or more often EU average -49%
Simulation programs	Only 25% of institutions reported about licensed training simulation programs	N / A	Use by each student at least a few times a month or more frequent. Use by each student at least a few times a month or more frequent EU average - 35%
Design Computer Software	59% of the respondents use design software programs	N / A	Use by each student at least several times a month or more often N / A
Educational Management Programs	33% use them from the total number of respondents	N / A	N / A
Educational content management programs	25% of institutions reported usage of educational content management programs		N / A

INDICATOR	AVERAGE TVE INSTITUTIONS	MINIMUM STANDARDS IN THE REPUBLIC OF MOLDOVA	EUROPEAN HECC & AVERAGE STANDARDS
Access to Online Learning Resources (VLE)	Only two institutions out of 13 reported permanent usage of online study resources (online library). More than 50% of the institutions reported regular use of information distribution modules (e.g. drive) to send secondary methodological materials (e.g. extra reading, course support, etc.)	N / A	65%
Educational Applications	No institution reported on the use of educational applications	N / A	Use by each student at least a few times per month a week or more often EU average - 41%
Digital textbooks	The systematic use of digital textbooks has not been reported	N / A	Use by each student at least a few times per month a week or more often EU average - 45%

The technical facilities analysed in the applied questionnaire also denotes the endowment of institutions with facilities like photo and video cameras, thus 55% of the institutions have at least one camera per institution and about 30% of the institutions have at least one video camera. On the basis of the technical endowment observation sheet, the infrastructure and equipment part was analysed through interviews with the managers of the educational institutions. They reported in particular about lack or poor usage of software / software infrastructure and poor interconnection of computers with the networks and servers. Only two institutions reported that they are in the process of developing a system of access to online learning resources (VLE), and two other institutions reported the same thing. However, the exchange of information on these portals is complementary and not primary. Another problem documented in the interviews and observations in institutions is the lack of authorized programming software, simulation and use of technical potential of institutional equipment. This refers to both specialized programs for faculty and basic software such as the MS Office package.

Most institutions meet the minimum national standards, where comparatively the IT and Transport Institutions have a much higher endowment than the minimum standard in the field, and the pedagogical institutions are very close to the national minimum standard with 20.6 students per 1 computer. At the same time, all institutions are far from the standard recommended by HECCC which is 3 students per computer.

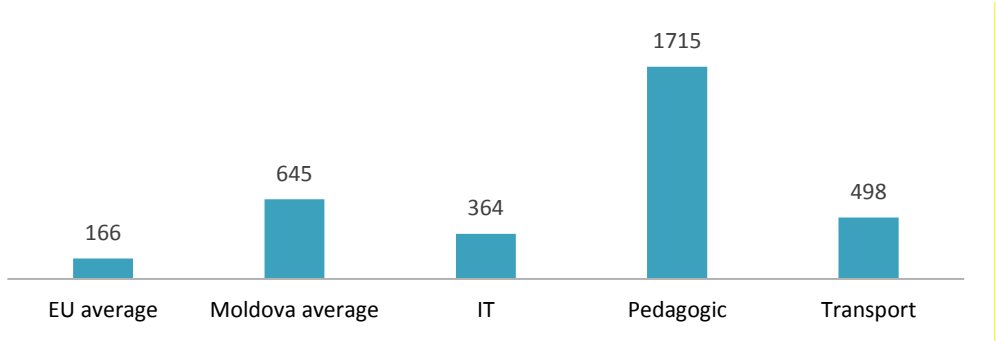
FIGURE 30. SHARE OF STUDENTS PER COMPUTER IN TECHNICAL PROFESSIONAL INSTITUTIONS, %



In terms of **networks and servers**, on average, 35% of institutions have a server or an internal network, however educational institutions have not reported the use of servers or networks within the institution, IT institutions have a 66% the availability of a sever and network within the institution, while 50% of the Transport institutions have at least one server and computers interconnected within the internal network within the institution. Although minimum standards in the Republic of Moldova do not prescribed any requirements for the use of servers, EU practices recommend that institutions have at least one server and one network per institution.

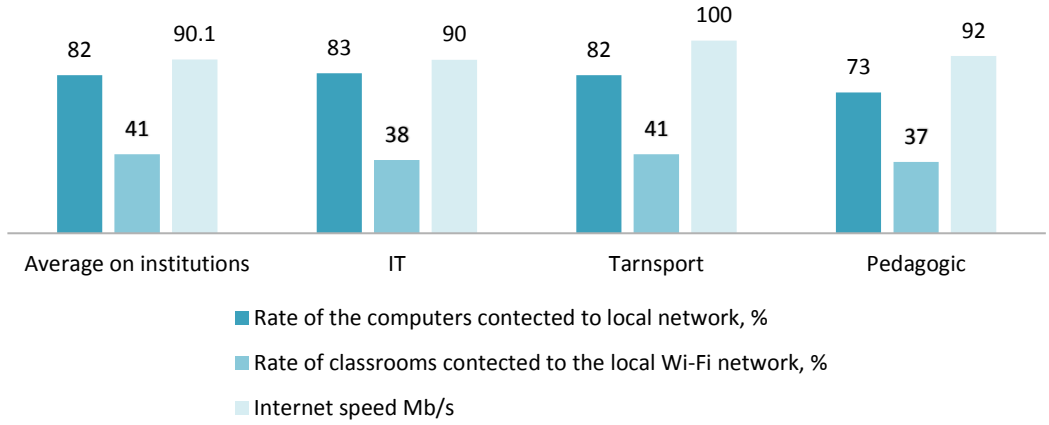
The interactive board rate per student in Moldovan institutions is much below the European average (166 students per interactive board, most institutions compensate that by using integrating projectors into the teaching process, so all institutions are equipped with projectors.) The low number of interactive and additional computer equipment makes decrease the number of multimedia classrooms, thus, practically 6 out of 13 institutions have no multimedia classrooms, out of 7 institutions that have interactive classes only 3 have more than one interactive class, which substantially restricts ICT integration for those subjects that typically do not use computer rooms in the teaching process.

FIGURE 31. RATE OF STUDENTS PER INTERACTIVE BOARDS IN TECHNICAL PROFESSIONAL INSTITUTIONS, %



In the chapter on interconnectivity and **internet access, the recommendations** at European level are that educational institutions have a 100% connectivity of computers in the institution internet, also the building is connected to WI-FI. The average internet speed in the institutions in EU varies between 30 and 100 mb / s. The standards in the Republic of Moldova do not specify indicators on interconnectivity and Internet access. Even so, the interviewed institutions have an average of 82% of all computers connected to Internet and an average Internet connection speed of 90.1 MB / s. Wi-Fi covers 41% of the institution building.

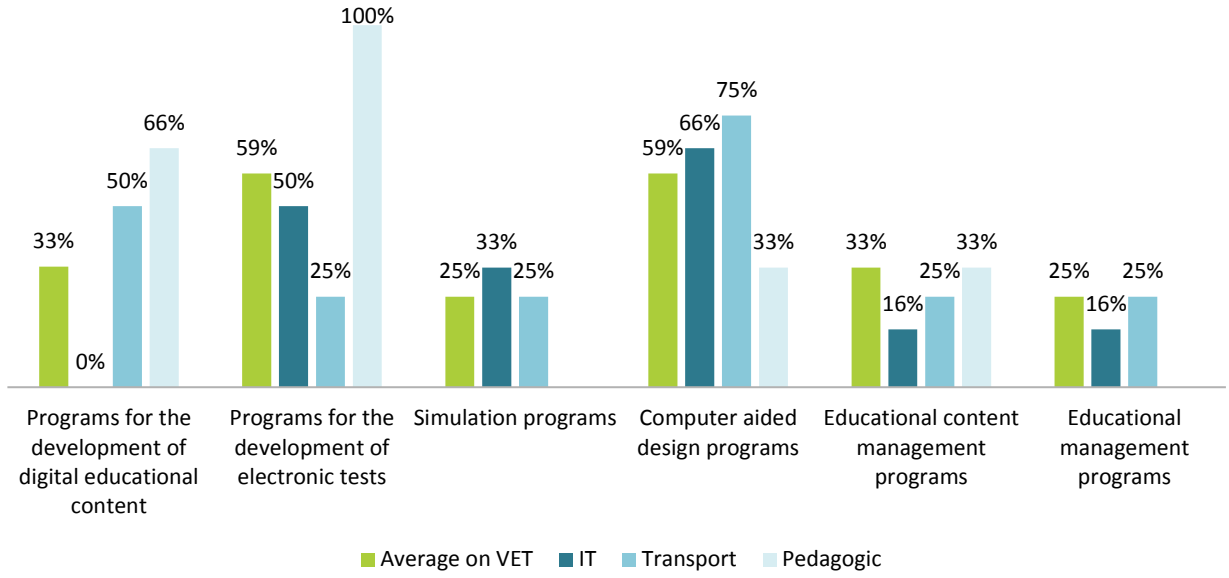
FIGURE 32. CONNECTION TO INTERNET IN TECHNICAL PROFESSIONAL INSTITUTIONS, %



European Best Practices Integrated in HECC) recommends the use of the following software: simulation, computer design, e-learning, educational content management, educational management at least a few times a month. The recommendations also include young people's access to online learning

resources and synchronize the digital process of studying materials. The results of the endowments with software and infrastructure programs in institutions have shown reduced usage and integration of a wide range of digital programs, applications and tools in the educational process and development process management of educational content or facilitating access to materials. None of the institutions has a systematic manual digital policy, this phenomenon being mentioned sporadically in discussions with institutional managers, as well as the integration of mobile applications in the study process is reduced to 0, the use of assisted programming applications, simulation and the development of educational content differs depending on the profile of the institution, assisted programming software being the most used in IT institutions, simulation programs in transport institutions, and educational content development programs in pedagogical institutions. The most used programs in all institutions are the development and implementation of electronic tests.

FIGURE 33. APPLY SOFTWARE PROGRAMS IN THE PROCESS OF TECHNICAL PROFFESIONAL EDUCTAION, %



6.4. ANALYSIS OF TEACHING MATERIALS FROM ICT PERSPECTIVE

6.4.1. METHODOLOGY

Definitions. The analysis was based on the following definitions:

Teaching material – A special type of visual means, especially books, tables, sets of text books, numbers or drawings, mixtures, plants, animals, etc. distributed to students for independent work in the classroom and at home or demonstrated by the teacher in front of the whole class.

Digital methodological material –Documents intentionally developed for use in the educational process, using general application programs (or widely used educational software environments) and constructed in accordance with the content of the educational theme and the methodology of the subject.

Digital teaching materials can contain computer tasks, reference information, content studied (text, graphics, animated scenes, etc.), assessment materials. Sometimes in digital methodological material it is advisable to include program modules that provide feedback to students.

Kinds of digital teaching materials. The genres concerned were defined as follows:

Course *content* – course support, textbooks, figures, schemes, images, animation, audio sequences, video sequences.

Practical computer activities – task of drafting text documents, spreadsheets, presentations; tasks to perform simulations, virtual experiments; tasks of training, ongoing courses.

Reference information – dictionaries, wiki, straightening, instructions.

Evaluations – digital tests, questionnaires.

In the analysis process the following classifications were used.

Classification of digital methodological materials by methodical destination:

- ✓ Studies (manual, course support, lesson).
- ✓ Demonstration (presentation, film, video, phonogram, audio).
- ✓ Information (dictionary, catalogue, wiki, guide, guidelines, instructions, rules, reference book, etc.).
- ✓ Computer exercises (practical tasks, methodical instructions).
- ✓ Computer training (practical tasks, methodical instructions).
- ✓ Simulation on the computer (simulation tasks, methodical instructions).
- ✓ Computer assessment (tests, questionnaires).

Classification of digital methodological materials according to the methodological goal:

- ✓ Send information.
- ✓ Upgrade knowledge.
- ✓ Consolidate knowledge.
- ✓ Generalize knowledge.
- ✓ Evaluate the level of assimilating knowledge.
- ✓ Train and develop skills.
- ✓ Evaluate the level of skills development.

It is known that digital methodology denotes a certain model to integrate information and communication technologies in the educational process. It should spread all components of the training process by including interactive multimedia activities. The digital methodology materials include all the content of the printed material, plus (or instead of the printed material) specific elements: interactive exercises of various kinds, animations, video sequences, images and simulations that, through use, bring extra cognitive profit. Digital material may also contain educational activities intended to be understood,

Basic functionalities of methodologic material. The most important element of novelty brought by digital teaching materials is interactive multimedia extensions (EMI). The levels of complexity of EMI are:

1. *Static:* includes educational elements with which the student has a low interaction: extensive texts, images, diagrams and handouts papers.
2. *Animated:* includes animations of text, figures, drawings, diagrams.
1. *Audio:* contains sound that can be controlled by standard control (Play, Pause, Stop, and Volume).
3. *Video:* includes movies (with or without soundtrack) or videos on which the student has limited play, stop, and pause.
2. *Interactive: It* includes educational elements with high degree of interactivity - experiences in virtual laboratories, process simulations, problem solving, educational games, through which the student succeeds, through game, experiment and discovery, to achieve a higher cognitive profit.
3. *Complex:* dedicated software applications that provide a continuity of accumulations / competencies acquired by the student throughout the use of each unit of learning as well as throughout the teaching material.
4. *External:* references to reliable, stable and consistent resources located in secure Internet locations and providing the legal right for free access and use for educational purposes (online dictionaries and encyclopaedias, interactive web applications, virtual laboratories, etc.)

Thus, when analysing the digital methodologic material, it was taken into account that the use of EMI extends the learning model based on the methodologic material, turning it from a closed, single-edged one into an expandable open model connected to the information space digital learning.

The complementary functions of the digital teaching material subject to evaluation included:

1. notes:
   a. Notes –Tools for adding notes to pages, related to certain areas of text or images.
   b. Bookmarks –tools to highlight text fragments in the page.
2. navigation:
   a. Bookmarks –Instruments for establishing fixed locations that can be accessed directly.
   b. Contains hypertext.

Functions for students with special educational needs. In order to expand inclusive education, the following facilities have been checked during the digital teaching materials analysis process:

Tool to edit for material components: text, sound, EMI.

1. Colour range control, presence of high contrast colour schemes.
2. Duplicating text sequences from the teaching material through sound sequences.
3. Sound control or gestures.

Evaluation of digital educational materials. In general, digital handbook evaluation can be done in two dimensions:

- The evaluation of the traditional component, which is broadly identical to the printed version of the methodology material.
- Evaluation of the digital component itself.

Criteria for the evaluation of the traditional component:

- Compliance with the disciplinary curriculum.
- Scientific accuracy of content.
- Contribution of teaching material to the organization and management of the learning process.
- Structure of matter.
- Interdisciplinary links.
- Quality of illustrations, chrome and design (colours, drawings, diagrams, schemes, etc.).
- Quality of editing.
- Accessibility of teaching material.

Digital component evaluation criteria:

- The complexity of interactive multimedia extensions.
- Navigation features.
- Facilities for students with CES.
- The scientific correctness of interactive multimedia elements.
- The degree of correlation of interactive multimedia elements with the static, basic contents.
- Design of interactive multimedia elements (fixed imaging, colour range, size and resolution, video quality, sound quality).

Starting from the fact that the evaluation of the traditional component is not an object of study in the entire research process, the methodologic materials presented by the educational institutions were evaluated only on to the extent of digital component.

The collection of digital methodologic materials was done by the following methods:

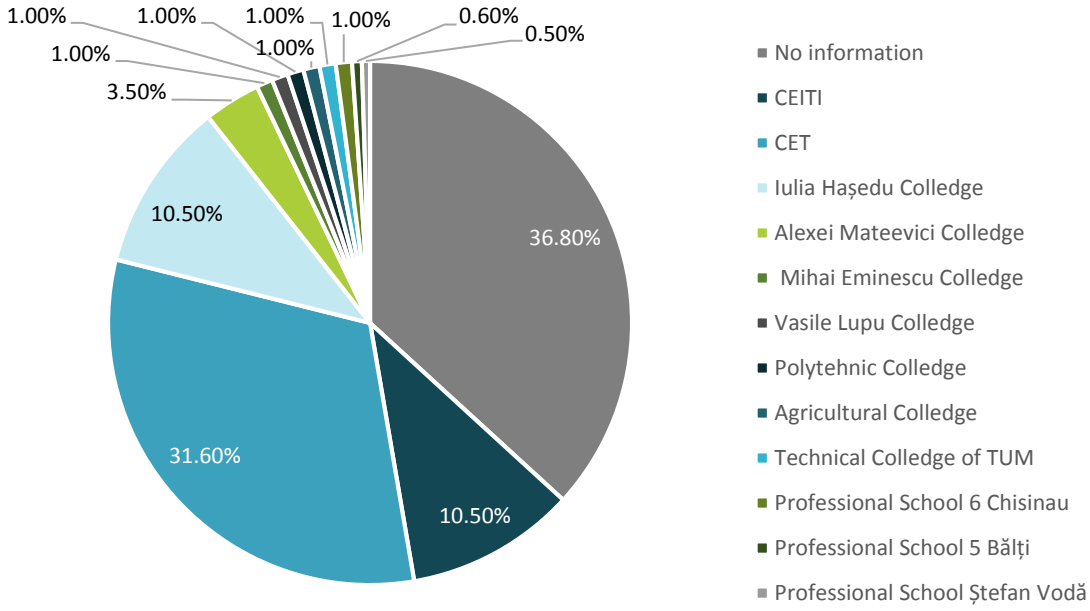
- administrative method, the management of each educational institution being asked to present the most representative materials;
- individual requests addressed to respondents –teachers, participating in interviews;
- Access Web page of the educational institutions.

6.4.2. GENERAL CARACTERISICTS OF METHODOLOGICAL MATERIALS SUBJECT TO ANALYSIS

In total, 76 titles of digital teaching materials were collected. Their distribution to technical vocational education institutions of different levels indicates that most of the digital methodological materials are

developed and used in the post-secondary level. In the case of secondary vocational technical institutions, the development of digital methodological materials is much more modest, most of them being taken from external sources. The figure below shows the data on the distribution of teaching materials by institutions.

FIGURE 34. DISTRIBUTION OF ANALYSED METHODOLOGICAL METARIALS BY INSTITUTIONS

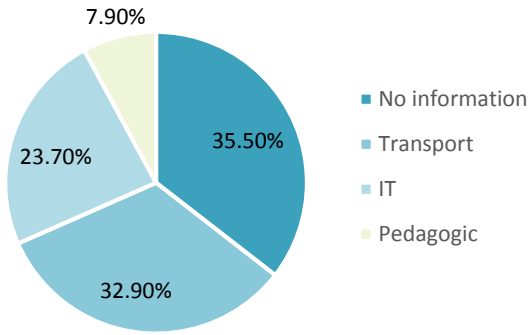


Although in the primary data collection process, no comprehensive inventory of methodological materials used in the study process has been made, from the distribution shown in *Fig. 1 it* is noticed that only some institutions are developing and using them more frequently.

In the case of a significant number of teaching materials under analysis, the area of training for which they are intended, has not been specified, and cannot be determined exclusively by analysing the content, such materials constituting 36%. If teaching digital materials can be related explicitly to a specific area of training, most are from the auto (transport)- about 33%, followed by IT (about 24%) and the fewest –in the pedagogical area (about 8%).

The absolute majority of digital methodological materials subject to evaluation do not contain explicit information about the specialty and course unit for which they are intended. Consequently, it is very difficult, if not impossible, to estimate the added teaching value that could be obtained by using the materials in question in the teaching-learning-evaluating process, the correspondence of the materials subject to the analysis of the requirements stipulated in the respective curriculum. Obviously, lack of information on course units also creates difficulties in their distribution / dissemination among pupils and teachers, especially from other educational institutions.

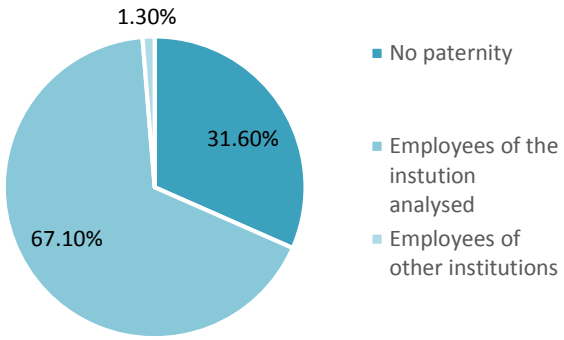
FIGURE 35. DISTRIBUTION OF METHODOLOGICAL MATERIALS ANALIZED BY AREAS OF TRAINING



6.4.3. PATERNITY OF DIGITAL METHODOLOGICAL MATERIALS

If it is a significant number of digital methodological materials (about 32%), either the authors themselves or their institutional membership cannot be established. In cases this membership can be established, most digital teaching materials (about 67%) are elaborated by the employees of the educational institutions which apply them.

FIGURE 36. DISTRIBUION OF METHODOLOGICAL DIGITAL MATERIALS BY INSTITUTIONAL REFERENCE OF THE AUTHORS

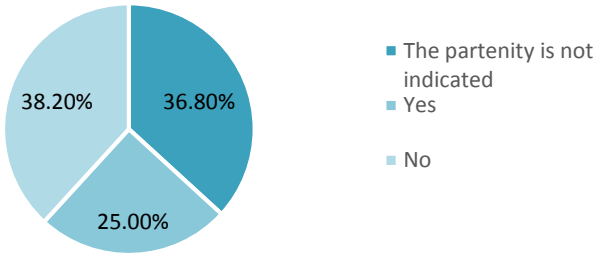


Obviously, there is currently no mechanism to ensure sharing of digital methodological materials elaborated within a particular educational institution. Also, there are no mechanisms for interinstitutional cooperation in the development of digital methodological materials.

Apparently, educational institutions do not use digital methodological materials elaborated by specialized companies and / or publishers, although some of these materials can be accessed free of charge. The reason is multiple: (i) inadequacy of the materials concerned in the curriculum; (ii) the relatively low level of digital skills mastered by students; (iii) low access to ICT technologies in educational institutions, etc.

About 25% of the digital teaching materials subject to evaluation are copyrighted. However, we note that the content of these materials includes materials which do not belong to mentioned authors and the source is not indicated. This could create copyright disputes, thus creating serious impediments in posting digital educational materials on the official websites of educational institutions.

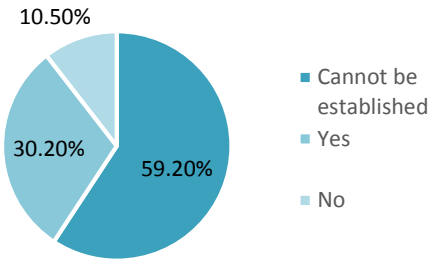
FIGURE 37. DISTRIBUTION OF METHODOLOGICAL MATERIALS PROTECTED BY COPYWRITE AND AUTHORS' RIGHTS



In 38% of digital methodological materials subject to investigation, the digital materials do not contain information on which the author or, at least, the institution in which he is performing his activity is established. This creates impediments in the evaluation of the quality of digital methodological materials, their subsequent approval by the methodological commissions of the educational institutions, the training of teachers in the area of computer based training.

It is known that elaboration and dissemination of open educational resources is an effective method to implement ICT in education. Taking it into account, the digital teaching materials under analysis were evaluated according to the criteria established towards open educational resources: they can be easily used, modified and restructured with no constraints. However, due to inconsistencies in the enforcement of copyright and related rights, about 60% of the digital teaching materials presented by educational institutions could not establish the status of an open educational resource.

FIGURE 38. DISTRIBUTION OF METHODOLOGICAL MATERIALS BY STATUS OF OPEN EDUCATIONAL RESOURSE

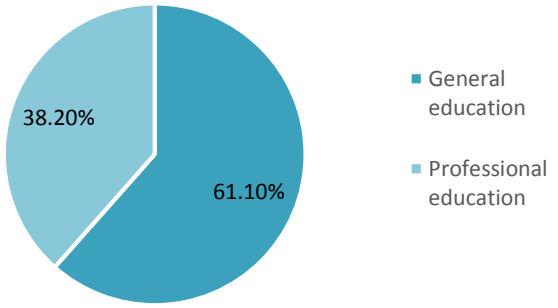


About 30% of the digital teaching materials presented by institutions have open educational status, and about 10% –no. Starting from the indisputable advantages of open educational resources, teachers and educational institutions as a whole, should be encouraged to develop such digital teaching materials, i.e. materials that can be easily used, adapted and redistributed, without constraints.

6.4.4. CONSTRUCTIVE VALUES OF THE DIGITAL TEACHING MATERIALS

The distribution of the digital methodological materials by teachers shows that most of them (about 62%) are used in the teaching-learning-evaluating process in specialized training modules.

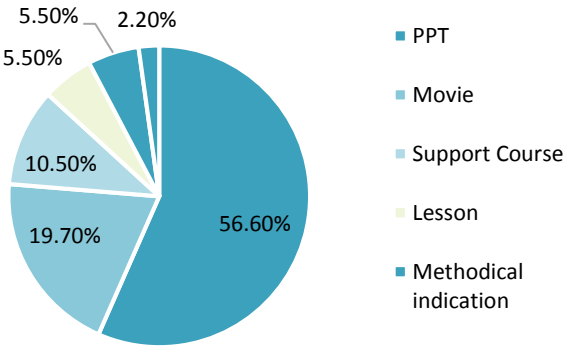
FIGURE 39. DISTRIBUTION OF METHODOLOGICAL MATERIALS BY TYPE OF SPACIALISATION TRAINING COURSE WHICH IT IS ELABORATED FOR



We emphasize, however, that the absolute majority of digital methodological materials refer only to general vocational training and less specialized training. To a certain extent, this is explained by the existence of more classical educational resources: books, plans, guidance, etc. on paper, which can be relatively easily transferred to digital equipment.

Analysing the distribution of digital teaching materials by type, we find that a large number of them (about 57%) are electronic presentations, used by teachers in theoretical lessons. Respondents stated that they provide the presentations to their students, but a detailed analysis of the content of the presentations reveals that they are effective only when they are accompanied by the verbal explanations of the teachers / professors.

FIGURE 40. DISTRIBUTION OF DIGITAL MATERIALS BY THEIR TYPE



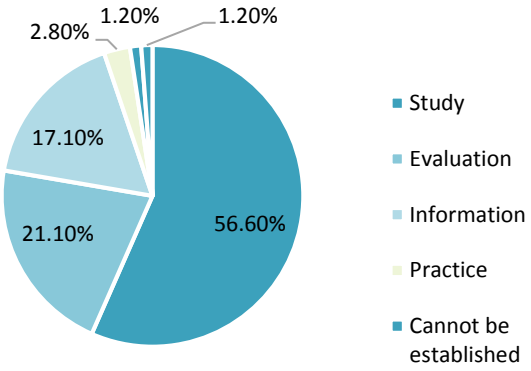
After the frequency of using the sample of digital methodological materials, presentations (57%) are followed by electronic tests (about 20%). The majority of these tests were developed during the certification exams, which were held during 2016-2018 at the specialties in the area of information and communication technology. Although presented on a digital basis, the few pedagogical tests are, de facto, static tests, which need to be printed and solved manually.

The supportive assistance to the course is 11% and the methodological guidelines –with a frequency of about 7%. Most of the digital resources of this type are in the area of transport training. Few electronic lessons (about 5%) are in the field of information and communication technology and are created in the Moodle learning / content management system administered by the Centre for Excellence in Information Technology and Information Technology.

Regretfully, the educational institutions did not present methodological materials such as video-audio, training films, practical tasks.

The analysis of digital methodological materials according to the predominant method reveals that about 57% of them are intended for students to study the theoretical subjects, the study itself presupposes reading the materials and solving grid tests.

FIGURE 41. DISTRIBUTION OF METHODOLOGICAL MATERIALS BY PREDONOMIANT DESTINATION METHOD



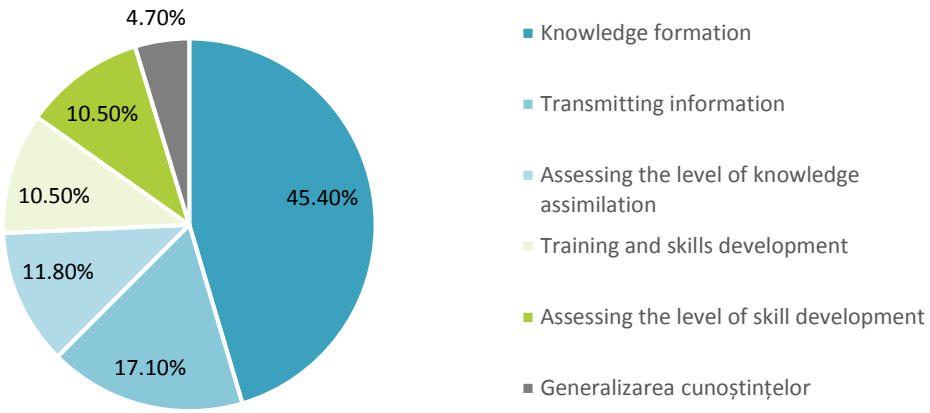
As mentioned above, the educational institutions pay particular attention to the automation of the students' theoretical knowledge evaluation processes. As a proof is that 21% of the offered digital methodological materials represent different categories of electronic tests grouped by items, which can help each teacher build up their own tests. Regretfully, such items are only available to specialists in the IT training area.

The next group of digital materials (about 17%) is methodologically intended to spread the information, and mainly contains only text, selected and systematized by teachers based on certain criteria.

Unfortunately, the samples presented by the institutions, do not identify digital teaching materials the methodical destination, such as training, instructing, simulation etc., absolutely necessary in the technical professional training.

Almost half of the digital methodological materials subject to evaluation (about 48%) have the theoretical knowledge as a methodological goal. An ordinary supply of information is attested to about 17% of the digital teaching materials under evaluation.

FIGURE 42. DISTRIBUTION OF METHODOLOGICAL MATERIALS BY METHODOLOGICAL PURPOSES

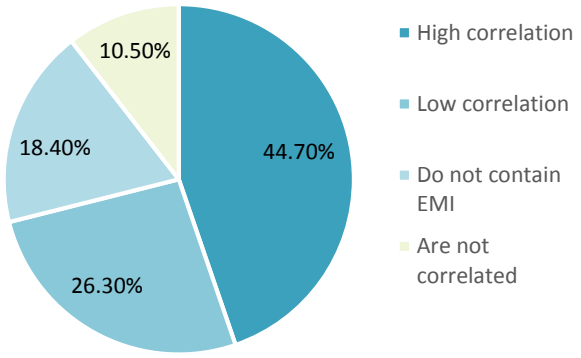


It is satisfying that about 10% of the teaching materials are aimed at training and skills development, and in another 10% – evaluating the level of development of the abilities concerned. However, as mentioned above, these abilities refer more to cognitive skills (simple calculations, classifications, document drawings, algorithms implementation in visual programming environments, methodological projects elaboration, etc.) and less (installation, diagnostics, software troubleshooting, educational activities, etc.).

The constructive value of any digital methodological materials also depends to a large extent on the degree of correlation of the interactive multimedia elements with the static, basic contents of its component.

The analysis of digital educational materials presented by educational institutions reveals that some authors insert various interactive multimedia elements into the methodological materials they have developed only to demonstrate that they possess the respective technologies, and the mentioned elements have no contribution to achieving the educational objectives tracked. Thus, in about 11% of the evaluated methodological materials, interactive multimedia elements are found that are not correlated with the static, basic texts; in some 26% of teaching materials this correlation is poor.

FIGURE 43. LEVEL OF CORRELATION OF MULTIMEDIA INTERACTIVE ELEMENTS WITH STATIC, BASIC CONTANT FROM THE COMPONENT OF DIGITAL MATERIALS



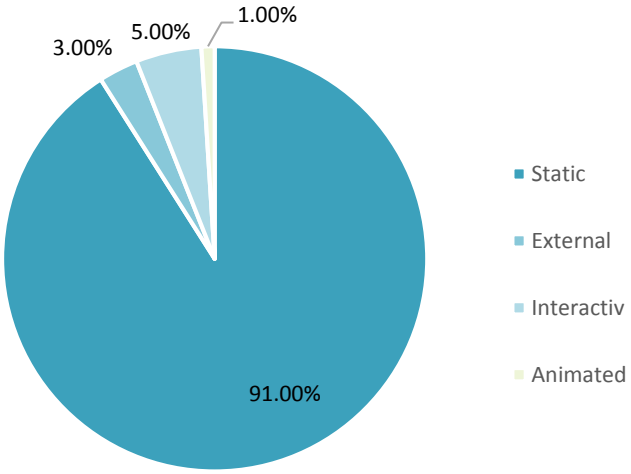
A strong correlation is only valid for about 45% of the digital methodological materials subject to evaluation, which indicates that in the development of digital materials the informatics aspects usually dominate the methodological aspects. Obviously, a training for teachers and managers is required to solve this situation.

6.4.5. SEARCH NEW OPPORTUNITIES OFFERED BY THE DIGITAL TECHNOLOGIES

It is known that the new opportunities offered by digital technologies are being examined by moving from static content (texts, images) to multimedia content (animations, video, audio) and means of interactivity (simulations, feedback, digital labs). The materialization of these opportunities is achieved by including interactive multimedia extensions (EMI) in the digital teaching materials. We remind that in the present study these extensions were grouped by levels of complexity, from static to external.

The analysis of the digital teaching materials presented by the educational institutions reveals that the absolute majority of the EMI in their composition, about 91%, are static, which are texts and images.

FIGURE 44. DISTRIBUTION OF METHODOLOGICAL MATERIALS BY THE HIGHEST LEVEL OF COMPLEXITY OF MULTIMEDIA INTERRACTIVE EXTENSION



The digital teaching materials containing animations make up about 1% of the whole sample, and the interactive ones –only 5%. The interactivity contained in the teaching material in question relates only to student interaction with automated knowledge assessment systems, without including simulations, virtual experiences, and educational games.

No learning materials containing audio or video have been identified, which seems strange, as the modern means of recording, processing and disseminating audio and video are accessible to educational institutions. Obviously, in case of technical vocational education, such sequences would complement the theoretical information with information specific to the environment of production or service providing sphere, the future job of the graduate.

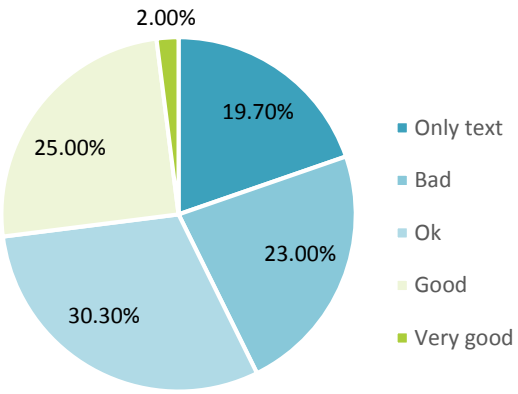
Although some digital teaching materials have encountered external multimedia elements (about 3%), they referred more to on-line dictionaries and encyclopaedias, and less to interactive web applications, virtual labs, etc.

None of the educational institutions indicated that they are offering students some practical tasks that can be solved, computer based design systems, graphical-interactive development of computer products, etc., although such activities have been attested during the visits in institutions. Possibly, teachers do not consider such tasks as methodological materials, although they really are

Indisputably, in contrast to traditional paper-based teaching materials, digital technologies offer much more opportunities to provide teaching materials with an attractive design and increased educational efficiency. For these reasons, the digital materials presented by the educational institutions were analysed in terms of design, especially the design of multimedia elements in their composition: sufficient resolution, colour and adequate illumination, contrast, clarity and good sound quality.

To find that over a quarter of the teaching materials under evaluation have a good and very good design, and about a third –a satisfactory design.

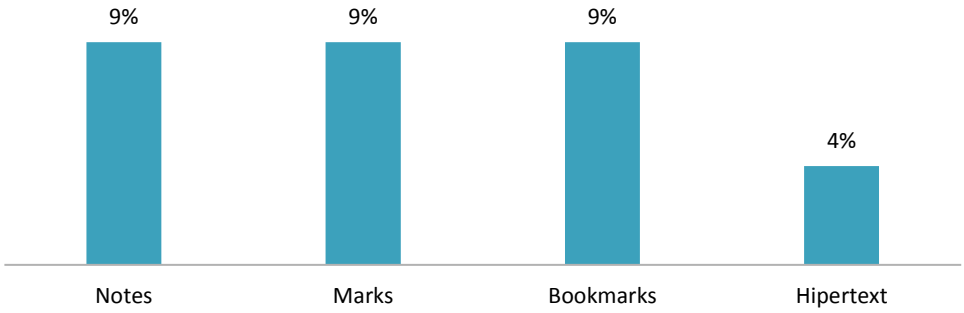
FIGURE 45. DISTRIBUTION OF METHODOLOGICAL MATERIALS BY QUALITY OF INTERRACTIVE MULTIMEDIA DESIGN



Unfortunately, about a quarter of the materials subject to evaluation are unsatisfactory, and about one-fifth of the digital materials contain only text, which obviously does not allow full usage of the opportunities offered by information and communication technology.

The effectiveness of using digital methodological materials depends, to a certain extent, on complementary functions such as notes, bookmarks and hypertext. The analysis of the materials presented by the institutions reveals that only a small part of them, about 9%, have such benefits.

FIGURE 46.METHODOLOGICAL MATERIALS WITH ADDITIONAL BENEFITS

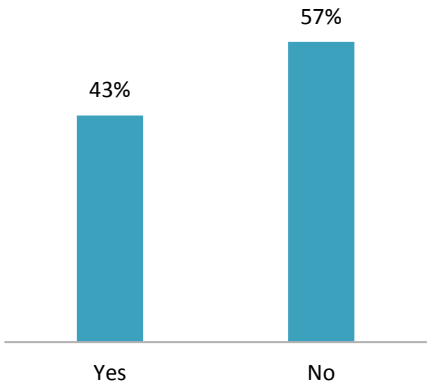


We emphasize that these benefits are not contributions of the authors of digital materials, but rather facilities included in visualization / rendering programs. Adding additional benefits presupposes the mastery of specific digital competences by the authors of the teaching materials, it becomes evident the need for further training of teachers in the field of digital content development, specific to computer-assisted training.

6.4.6. BENEFITS FOR STUDENTS WITH SPECIAL EDUCATIONAL NEED AND DISABILITEIS (SEND)

The research carried out in this study also analysed the extent to which the digital methodological materials presented by the educational institutions contribute to the involvement of students with special educational needs. Find out that from the facilities recommended by specialists in the field (component resizing, colour range control, text sound, sound control, or gestures), only resize components are implemented. But this benefit is only implemented in about 43% of the digital teaching materials under analysis.

FIGURE 47. METHODOLOGICAL MATERIALS WHICH BENEFIT STUDENTS WITH CES



As additional benefits, the ones for students with SEND are not characteristic for methodological digital teaching materials themselves but rather belong to visualization / rendering programs.

It is obvious that the implementation of benefits for students with special educational needs requires specialized approaches, which presupposes the provision of methodological and technological support by the structures in the field of education. It is also necessary for educational institutions to have the equipment and program products that could actually provide corresponding benefits (comprehensive technical means and technologies).

6.5. ENSURE GENDER EQUALITY AND ACCES OF VULNERABLE GROUPS, INCLUDING PEOPLE WITH SER FOR TVE EDUCATION

Ensuring Gender Equality in Technical Vocational Education is an important challenge. History in secondary, post-secondary vocational technical schools provided more education to boys than girls. Such a situation is explained primarily by the specifics of the studies, which are mostly carried out in technical fields.

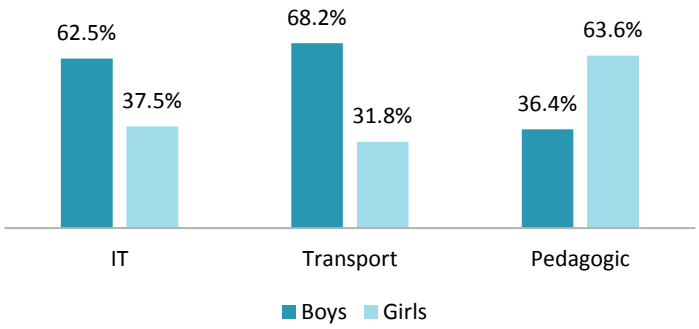
TABEL 19. EVOLUTION OF NUMBER OF STUDENTS IN TVE INSTITUTIONS BY COURSE CATEGORIES

TIPE OF STUDIES	2015/2016		2016/2017		2017/2018	
	F	B	F	B	F	B
PT Secondary	5 635	13 345	4 568	12 380	4196	11 110
PT Postsecondary	3 721	3 068	3 282	3 085	3 697	3 328
TOTAL	**9 356**	**16 413**	**7 850**	**15 465**	**7 893**	**14 438**

Source: BNS

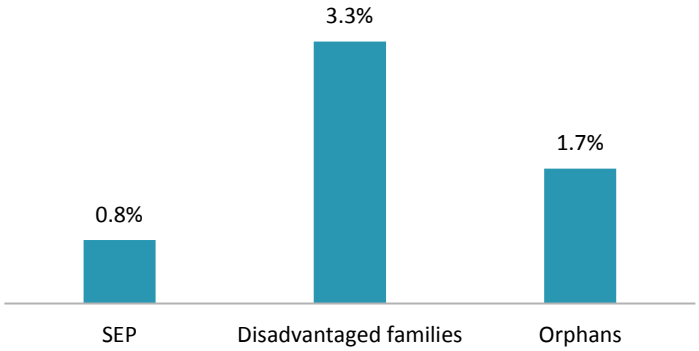
A similar situation is also found for the areas analysed in the survey. For technical fields such as transport and IT, the share of boys among students is approx. 2 times higher than girls, while in the pedagogical field the situation is the opposite

FIGURE 48. DISTRIBUTION OF STUDENTS BY GENDER IN THE AREA OF SPECIALIZATION, %



The share of students in disadvantaged families and those with special educational needs is relatively low, and in most of the institutions participating in the study there are no persons in the list of students who fall, at least formally, in these categories of persons.

FIGURE 49. NUMBER OF VULNERABLE STUDENTS IN TVE, %



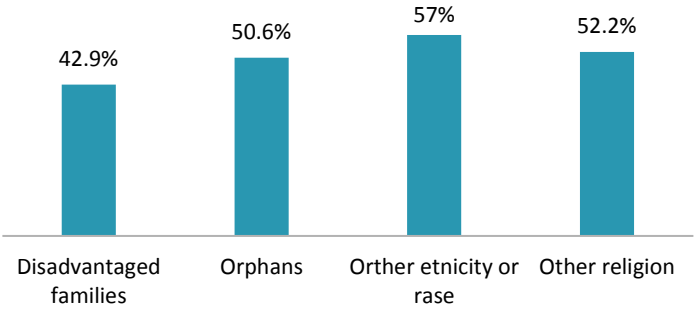
The reduced number of disadvantaged children, especially those with CES, is also explained by the lack of reinforcement of the discovery process. Thus, a pedagogical managerial framework mentioned that *"... here we have a little girl, but again, her mother has not brought any documents, and she goes like that."*

On the other hand, the reduced number of children with SER is also explained by the specifics of the studied specialties, for which the pupils with disabilities cannot be trained. As mentioned in a transport management framework *"... it is not very specialized with students with CES. We are preparing workers. And a student with.... They clearly have their integration into society, but it is clear that there are specialties where health requirements must have the ability to ... A specialty accountant, secretary may, who can also prepare with SER ... But we have such specialties as tractors, car mechanics. Who must be healthy ..."* This position is supported by another transport management framework "Depends *on the specialty. Because some of the specialties have certain requirements. What's about the technical side? In some cases it is difficult to teach the pupil. It's the Automotive Traffic. At the organizational level, it's more in the situation today, it is computer work, or documents - that's it. In the rest, other specialties provide for the execution of certain works, physical efforts ..."*

Regarding the use of facilities to ensure access to education for students with CES, the teachers' questionnaire analysis reveals that in most of the cases (75%) teachers do not have any special tools to facilitate the educational process.

In the same way, teachers believe that in most cases the use of such means would facilitate the education process in the case of children at risk of discrimination based on race, social well-being or beliefs, by increasing the interactivity and promoting the principle of child-centred education.

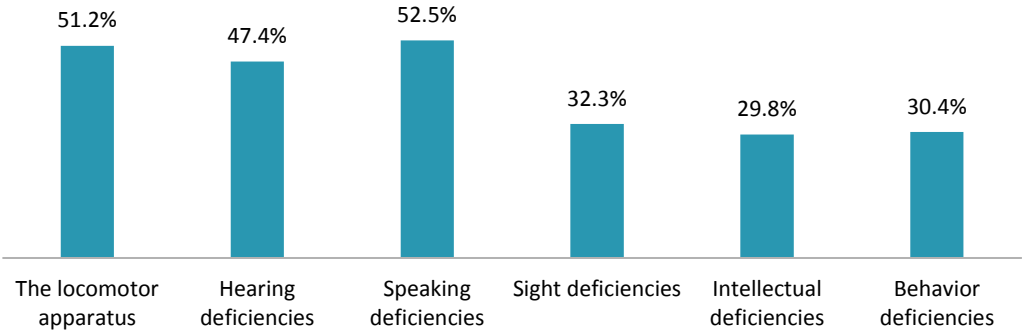
FIGURE 50. NUMBER OF TEACHERS WHO CONSIDER THAT THE APPLICATION OF ICT MEANS FACILITATE TO A BIG EXTENT THE PROCESS OF TEACHING AND EVALUATING STUDENTS UNDER RISK OF DISCRIMINATION, %



Among the main teachers' fears regarding the use of ICT in relation to children from disadvantaged families and orphans is the lack of access to ICT for such students. Thus, in the case of orphans, 12% of teachers believe that the application of ICT would be in detriment of students, and in the case of those from disadvantaged families, 17% of teachers believe that the use of ICT would harm them.

In the case of children with different forms of disturbance, teachers are more confident about the positive impact of using ICT on the teaching process and applying the principle of child-centred education. Thus, only children with locomotor problems, deaf and speech disorders, more than one-third of teachers believe that the application of ICT would facilitate the integration of these children into the educational process.

FIGURE 51. NUMBER OF TEACHERS WHO CONSIDER THAT APPLYING ICT CONSIDER THAT IT WOULD FACILITATE TO A GREAT EXTENT THE PROCESS OF TEACHING AND EVALUATING STUDENTS WITH CES, %



Concerning the fear of the failure to apply ICT tools to facilitate EIP and the integration of students with learning disabilities, especially intellectual, and social deficiencies, the most important are those related to the fact that ICT is not adapted to the needs of students - 15%.

6.6. MANAGEMENT PROCESS

The process of identifying indicators of the use of ICT in the management process of TVE institutions has been identified on the basis of several performance indicators, namely:

- ✓ Use of ICT in keeping and distributing information and facilitating access to open data;
- ✓ Online timetable planning;
- ✓ Communication with partners and hierarchically superior institutions,
- ✓ ICT in staff management and other school management mechanisms

These indicators have been taken up and adapted both from the literature recommending ICT integration in the above-mentioned dimensions, but also from Estonian eKool's practice which has developed an integrated school management system that provides students, parents, teachers, managers, public institutions and (including I each student, teacher, managerial framework), online documentation and school materials management, human resource management and teaching (including timetable management through ICT), online access to online statistics on the institution.

It should be noted that both in practice Estonian with eKool as well as other models of digital management process are using a portal of online studies (Virtual Learning Environment) available in various sizes for students, parents and public institutions and tool extension for methodological process management.

According to the observation form in the Republic of Moldova, only 2 institutions have developed an online education portal of the institution, of which one has integrated in this portal a module for teachers, managers, and parents. In this case, we can only speak of the partial integration of separate tools in school management. The technologies used in the managerial process were analysed quantitatively through interviews with the managerial and validated frameworks within the focus of the organized groups.

TABLE 20: LEVEL OF USING ICT TOOLS IN THE MANAGEMENT PROCESS

INDICATOR	LEVEL OF DEVELOPMENT			
	INCIPIENT	WEAK	AVERAGE	ADVANCED
	ICT is used unsystematically to process and edit text, as is the use of primary communication applications (word, excel, ppt, email)	The methodological ICT management process involves clear procedures that include the use of basic programs and applications	The institution integrates advanced ICT mechanisms but they are poorly interconnected (cloud usage, personalized mail for each teacher, real-time timetable)	There is a real-time system that integrates all elements of methodological management (VLE)
Using ICT to store and distribute information and facilitate access to open data	3 institutions said they did not use systematically any information storage and distribution platforms. Upon request, the information is distributed by email.	4 Institutions use systematically	5 Institutions have reported the constant and systematic use of exchange programs and access to information (e.g.) drive. The institution's web pages are placed with a set of basic information	1 institution provides instant access for students, teachers and parents to the materials, study results
Online planning	6 institutions have electronic timetable just as a backup. It cannot be accessed only in paper	4 institutions posted the timetable on the institution's website, but this is only changed every 6 months.	2 institutions offer word time access on the google docs platform where students can access it	1 institution has an online schedule that changes in real time
Communication with partners and hierarchically superior institutions		13 Institutions reported that most of the communication is by email. The Ministry has made available to the TVE institutions a portal		

INDICATOR	LEVEL OF DEVELOPMENT			
	INCIPIENT	WEAK	AVERAGE	ADVANCED
		from where they can access relevant documents. However, a number of managers reported drawbacks periodically.		
ICT in staff management and other school management mechanisms.	5 institutions said they did not use systematically	3 Institutions have mentioned the constant use of distribution and access to documents (e,g Drive, dropbox)	3 institutions have mentioned the use of the Moodle platform to digital a set of educational process management procedures	1 institution reported the development of time sheets and teaching materials management materials (hours, etc.)

The specifics of usage ICT in the management process in mentioned institutions is the inconsistency in the integration of information technologies in the management process. They are used as an adjacent and unsystematic element in the management process. Regardless of the degree and complexity of tools used in institutions, their use is not prescribed in institutional documents and procedures, ICT tools are secondary to the reporting, communication and organization of management activity on paper.

The most common tools in the management process are web resources for external storage and distribution of information (drive), their use has been mentioned virtually in all cases. Though the web pages which existing in all institutions, provide less than half of the opportunities for technical access to materials that can be used in educational process management. An essential indicator for the use of ICT in keeping and distributing information and facilitating access to open data relates to the management timetable, only 3 institutions have the technical possibilities to publish the timetable and to make changes online. Similarly, technical facilities for distributing online information about student performance to parents are provided by only one institution out of 13.

In the case of staff management, only one institution offers teachers and administrators the opportunity to keep their schedule (time table) in electronic format. In the other cases, the time table and other statistical data are usually compiled and stored electronically by the administrative office, in most cases they are stored in text format rather than the tables or databases, and respectively the modification of data at the level of institutions in the management process is complicated and poorly managed in most cases.

The use of ICT in communication between teachers and administration is widely used through mobile communication applications (viber, whatsapp) and closed groups on social networks. Their usage is not a mandatory one and rather serves as an informal element of communication within the institutions.

7. INDICATORS FRAMEWORK

N/O	INDICATOR	VALUE	MEASUREMENT UNIT	COMMENTS
Pupil's digital competences				
1	Number of students from TVE Institutions that have an email address	98.6	%	
2	Number of TVE students who have a personal social networking account	100	%	
3	Number of TVE students that have personal a computer (Desktop or Laptop)	77.6	%	Students who declared that they have a tablet or a smartphone were not included
4	Number of TVE students with medium or high digital skills (General)	27.3	%	
5	Number of TVE students who have medium or high-level digital skills in editing TEXT documents	26.1	%	
6	Number of TVE students with medium or high digital skills in editing Tabular Calculations (spreadsheets) documents	15.9	%	
7	Number of VET students who have medium or high-level digital skills in editing ELECTRONIC PRESENTATION documents	40.3	%	
8	Number of TVE students who have no digital skills at all (General)	13.6	%	Students who have failed to accumulate any points according to the evaluation scale
9	Number of TVE students who have no digital skills at all in editing TEXT documents	5.6	%	Students who have failed to accumulate any points according to the evaluation scale
10	Number of TVE students who do not have digital skills at all in editing Tabular calculation documents	23	%	Students who have failed to accumulate any points according to the evaluation scale
11	Number of TVE students who have no digital skills at all in editing ELECTRONIC PRESENTATION documents	12.8	%	Students who have failed to accumulate any points according to the evaluation scale
12	Number of TVE students coming from rural areas who have average or high digital competences	25.5	%	Students with high digital competence accumulated more than 50% of the maximum possible score.

N/O	INDICATOR	VALUE	MEASUREMENT UNIT	COMMENTS
13	Number of TVE students coming from the urban areas who have average or high digital competences	30.1	%	Students with high digital competence accumulated more than 50% of the maximum possible score.
14	The number of TVE girl students who have average or high digital skills	25.%	%	Students with high digital competence accumulated more than 50% of the maximum possible score.
15	The number of boys students in TVE who have average or high digital skills	28.1	%	Students with high digital competence accumulated more than 50% of the maximum possible score.
16	The number of TVE students using EMAIL in communication with colleagues	22.1	%	
17	Number of TVE students using SOCIAL NETWORKS in communication with colleagues	84.3	%	
18	Number of TVE students using of instant messaging apps in communication with colleagues	49.6	%	
19	The average number of hours a TVE student can use a computer of the educational institution after the lectures	3.42	hours	
Teachers digital competences and use of ICT in the Teaching-Learning-Evaluating process				
20	Number of TVE teachers who have an e-mail address	97.8	%	
21	Number of TVE teachers who have a personal social network account	97.4	%	
22	Number of TVE teachers that have a computer (Desktop or Laptop)	94.8	%	Teachers who declared that they have only a tablet or smartphone were not taken into account.
23	The average number of hours a TVE teacher can use the computers of the educational institution after the working hours	6.26	hours	
24	The average number of hours where teachers in TVE institutions use digital tools in the teaching process	33.8	%	
25	Number of teachers in TVE using digital tools in teaching process in more than 50% of hours	26.6	%	
26	Number of TVE teachers who regularly use TEXT documents in the teaching process	74	%	

N/O	INDICATOR	VALUE	MEASUREMENT UNIT	COMMENTS
27	Number of TVE teachers who regularly use Spreadsheets documents in the teaching process	27	%	
28	Number of TVE teachers who regularly use ELECTRONIC PRESENTATIONS in teaching	64	%	
29	Number of TVE teachers who regularly use AUDIO in the teaching process	28	%	
30	Number of TVE teachers who regularly use VIDEO in the teaching process	57	%	
31	Number of TVE teachers who regularly use DIGITAL IMAGES in the teaching process	17	%	
32	Number of TVE students who regularly use TEXT documents in the learning process	46	%	
33	Number of TVE students who regularly use Spreadsheet documents in the learning process	20	%	
34	Number of TVE students who regularly use power point presentations documents in the teaching process	43	%	
35	Number of TVE students who regularly uses AUDIO in the process of learning	51	%	
36	Number of TVE students that regularly use VIDEO in the teaching process	59	%	
37	Number of TVE students who regularly use DIGITAL IMAGES in the learning process	54	%	
38	Number of teachers that regularly use TEXT documents in the evaluation process	52	%	
39	Number of TVE teachers that use Spreadsheet documents in the regular evaluation process	14	%	
40	Number of TVE teachers who regularly use power point presentation documents in the evaluation process	50	%	

N/O	INDICATOR	VALUE	MEASUREMENT UNIT	COMMENTS
41	Number of TVE teachers that regularly use AUDIO in the process of evaluation	14	%	
42	Number of TVE teachers that regularly use VIDEOs in the evaluation process	25	%	
43	Number of TVE teachers using DIGITAL IMAGES in the evaluation process	33	%	
Equipment and Infrastructure				
44	Number of TVE Students per Computer	8	students	
45	Number of TVE institutions that have at least one server	35	%	
46	Number of computers connected to the Internet in TVE institutions	82	%	
47	Average area in institutions covered by Wi-Fi local area network	42	%	
48	Average internet network connection speed	91	MB/S	
49	Average report on the number of Digital Multimedia Projectors per TVE institution	9	projectors	
50	Average number of students per interactive whiteboard in TVE institutions	645	students	
51	Average number of institutions having soft/hardware	15.3	%	
52	Average number of institutions endowed with Educational Digital Content Development Programs	33.3	%	
53	Average number of institutions equipped with Electronic Test Elaboration / Use software	59	%	
54	Average number of institutions equipped with simulation software	25	%	
55	Number of institutions equipped with Computer Assisted Design Programs	59	%	
56	Average number of institutions endowed with Educational Management Programs	33	%	

N/O	INDICATOR	VALUE	MEASUREMENT UNIT	COMMENTS
57	Average number of institutions endowed with Educational Content Management Programs	25	%	
Use ICT tools in elaborating Teaching Materials				
58	Number of Digital Teaching Materials used by TVE teachers that with copyright protection	38.2	%	
59	Number of Digital Teaching Materials used by TVE teachers with the status of an open educational resource	30.2	%	
60	Number of Digital Teaching Materials used by TVE teachers used in the learning process	56.6	%	
61	Number of Digital Teaching Materials used by TVE teachers used for EVALUATION process	21.1	%	
62	Number of Digital Teaching Materials used by TVE teachers used for INFORMATION	17.1	%	
63	Number of Digital Teaching Materials used by TVE teachers in PRACTICE	2.8	%	
64	Number of Digital Teaching Materials used by TVE teachers designed to DEMONSTRATION	1.2	%	
65	Number of Digital Teaching Materials which have a high level of correlation between interactive multimedia elements with the static content	44.7	%	
66	Number of Digital Teaching Materials which contain qualitative (good and very good) interactive multimedia elements	27	%	
67	Number of Digital Teaching Materials which benefit students with SER	43	%	
Cross-cutting issues				
68	Number of girls in TVE institutions	35.3	%	
69	Number of girls in TVE institutions which learn Transport related specialties	31.8	%	
70	Number of girls in TVE institutions which learn IT related specialties	37.4	%	

N/O	INDICATOR	VALUE	MEASUREMENT UNIT	COMMENTS
71	Number of girls in TVE institutions which learn Pedagogy	63.6	%	
72	Number of SER students in TVE institutions	0.8	%	The indicator is not comprehensive because in many cases the process of including students with disabilities in SEN category is not structured.
73	Number of students from vulnerable families in TVE	3.3	%	
74	Number of orphans in TVE institutions	1.7	%	
Using ICT in Management professional Institutions				
75	Number of TVE institutions which have a system which facilitate the access to open data	46	%	Usage of the mentioned tools in these institutions is not the main option and represent a back-up solution.
76	Number of TVE institutions which apply on-line planning for the courses	23	%	Usage of the mentioned tools in these institutions is not the main option and represent a back-up solution.
77	Number of TVE Institutions which use specialized software for HR	30.7	%	
78	Number of TVE institutions which use complex communication systems for reporting to hierarchically superior institutions	0	%	

8. CONCLUSIONS AND RECCOMENDATIONS

8.1. CONCLUSIONS

8.1.1. STUDENTS' DIGITAL COMPETENCES

C1: Practically all VET students have personal accounts in at least one of the social networks and at least one personal e-mail address.

C2: The digital competencies of the overwhelming majority of students in Technical Vocational Education are below the minimum level set by the Minimum Standards of Digital Skills for Students in General Education.

C3: Regardless of the environment in which they come from, rural or urban, the level of students' digital competences is almost the same, a slightly advantage was shown by students from urban areas.

C4: The level of girls 'and boys' digital competencies is nearly the same, but boys achieve better results when editing Text and Tabular documents, and girls registered better results in elaborating power point presentation.

C5: The biggest number of students with medium and high-level digital skills is noticed in the field of IT professional training, followed by the area of Transport. At the same time, the highest rates of students with digital skills belong to the transport sector.

C6: Students consider the social networks to be the primary communication tool in digital environments.

C7: The absolute majority of students in technical vocational education do not have more advanced digital skills, such as grammar checking of texts or creating and editing diagrams.

C8: The lowest rate of students with medium and high digital competences are observed in the field of Tabular Calculation (00%). In this field, more than a fifth of the VET students do not have the minimum competencies required by the standards and gymnasium programs.

C9: In the area of electronic presentation, most students have elementary skills.

C10: TVET students are aware that their digital competencies are low and, consequently, they want additional training.

8.1.2. DIGITAL COMPETENCES OF SCHOOL MANAGERS AND ICT USAGE IN TEACHING-LEARNING-EVALUATING PROCESS

C11: Virtually all TVE teachers have personal accounts in at least one of the social networks and at least one personal e-mail address.

C12: Mostly teachers have access to the computers of the educational institution in developing digital methodological materials.

C13: For teachers, e-mail is the primary communication tool in the digital environment with both colleagues and students.

C14. In general, the use of digital tools in the teaching process is low, only a small number of teachers use digital tools for more than 50% of courses.

C15: Teachers prefer to use only elementary digital media such as text documents, electronic presentations, and video downloaded from different sources. At the same time, the electronic presentations used by the teachers mostly represent static material without interactive elements.

C16: Unlike teachers, students prefer to use video, digital images, audio in the process of learning.

C17: Students' low skills in tabular calculations can also be explained by the fact that this type of document is very rarely used by teachers as well as students in the learning process. In the absence of an ongoing practice, the skills of computer classes are taken care of.

C18: To evaluate students, the most popular tools used by teachers are text documents and electronic presentations. The use of electronic tests is a random solution, often applied to computer science lessons.

C19: Many of the teachers say they regularly use digital textbooks. However, as there are virtually no digital textbooks on the local market, this statement cannot be considered reliable. Most likely, with the phrase "Manual Digital", teachers refer to classical textbooks distributed to students on electronic and / or optical media.

C20: TVE institutions do not sufficiently motivate teachers to continue their education in the field of ICT education.

C21: The main areas of interest for teachers for ongoing ICT training are on-line security, digital content elaboration, and the use of cooperation tools.

8.1.3. INFRASTRUCTURE AND EQUIPMENT

C22: Computer hardware, more or less, correspond to national standards, but hardware with additional equipment (e.g Interactive boards, Servers, Networks) is insufficient, which restricts the possibilities of using ICT in the teaching process.

C23: The majority of the computers used by students are office computers, which reduces mobility and limits the use of ICT in only a few classrooms in each institution.

C24: About 80% of the institutions surveyed have fast Internet connections, with over 90 mbps connectivity. This provides student access to online resources. However, the coverage rate of WI-FI classrooms is still low.

C25: Methodological opportunities offered by ICT are not fully used. Thus, interactive boards are often used as a screen for broadcasting electronic presentations or text documents.

C26: In matters relating to the number of teachers and management with digital equipment, the requirements of the Minimum Standards are met in all educational institutions.

C27: The minimum number of computers is encountered in all analysed technical TVE institutions, but no institution has specialized software for the training areas. A small number of educational institutions have licensed software only for general activities (Operating Systems, Office, etc.).

C28: The use of simulation, programming and other specialised programs is relative and irregular. Their usage differs greatly depending on the profile of the institution, so it is different from one institution to another. Most institutions have mentioned the difficulty of purchasing and upgrading software and software infrastructure.

C29: The level of development of online institution-level studio is very low, as well as the integration of application in the process or the digital textbook

8.1.4. ANALYSIS OF DIGITAL TEACHING MATERIALS

C30: The development and usage of methodologic materials is more frequent in post-secondary vocational education institutions. In the case of secondary schools, their own elaborations are far beyond the standards, the digital teaching materials used being taken from external sources.

C31: A significant part of the teaching materials under assessment does not contain explicit information in the sphere of training, the specialty and the course unit they are intended for.

C32: The authors' institutional association, where they are indicated or can be established, derives from the fact that most of the teaching materials under evaluation are used only in the educational institutions

where they have been developed. There are no mechanisms that would ensure interinstitutional cooperation in the development of digital methodological materials and their delivery to all interested institutions / teachers.

C33: In the case of a significant number of digital methodological materials, copyright and related issues are not addressed. Accordingly, the dissemination and widespread use of such materials could lead to the appearance of intellectual property disputes.

C34: A significant part of the teaching material does not contain information on which the author and / or the institution in which he is active can be established. It is also not clear whether the materials in question have been approved by the methodological committees of the educational institutions.

C35: Because of the inconsistencies in copyright and related rights, only a small part of the digital methodological materials developed in educational institutions is in the category of open educational resources. This prevents the efforts of teachers and of the technical vocational education institutions from the same profile to focus their efforts on the development of quality digital teaching materials.

C36: Digital methodological materials developed and / or used in educational institutions are mainly of the type of electronic presentations and tests. There are also course handouts and methodical indications, but these materials are, de facto, traditional materials that have been transferred from paper to new digital media.

C37: According to the methodological destination and the educational goals pursued, the digital materials developed and / or used in the educational institutions mainly facilitate the theoretical knowledge of teaching-learning and evaluating processes, and less to the formation and development of abilities function-action. The number of methodological materials that contribute decisively to the formation and development of functional-action competences, i.e. those with methodical exercises for training, simulation etc. is modest.

C38: About half of the digital methodological material does not exist or there is a poor correlation between interactive multimedia elements and basic static contents. This fact shows that, often, in the elaboration of digital methodological materials the informatics issues dominate the methodological ones.

C39: From benefits designed for students with special educational needs, only the one for re-sizing digital methodological materials has been analysed. The implementation of other benefits, such as component re-sizing, colour control, text sound, sound control, or gestures, requires specialized approaches and endowment of educational institutions with compensatory technical means and assistive technologies.

8.1.5. CROSS SECTORIAL ASPECTS

C40: The number of students with SER learning in the institutions included in the study is relatively small. Perhaps not all students with specific needs followed the psycho-pedagogical evaluation procedures.

C41: In most institutions there are no digital assisting technologies. Apparently, this is in cases where SER students are offered improvised assisting means.

C42: According to the opinion of some teachers, the widespread implementation of ICT in the educational process could disadvantage students from vulnerable families and orphan students, as students in these categories would not have sufficient access, in particular in the learning process after class hours.

C43: According to teachers' opinion, the use of public ICT in the educational process would not be justified for students with visual, intellectual or social difficulties, as students in these categories need specialized ICT tools.

8.1.6. USAGE OF ICT IN MANAGEMENT OF TVE INSTITUTIONS

C44: The use of ICT in the management of TVE institutions is in its early stage, with only elementary tools such as e-mail and, occasionally, cooperative tools.

C45: Most institutions do not have specialized software for human resource management. Following on-the-spot checks, it was found that in most institutions all information on human resources is stored on paper.

C46: All institutions included in the study have a functional web page. However, the Websites of the analysed institutions contain only general information and do not represent cooperation portal that could be used by the institution's management, human resources and students.

C47: All TVE institutions have at least one web site responsible for the institution, most of which it is the computer science teacher.

C48: The use of ICT in financial management is irregular, only one TVE institution stating that it uses the electronic public procurement portal.

C49: Institutions, in large part, do not have funds to acquire ICT equipment. These are usually purchased at the end of the calendar year in the case of unused funds.

C50: Reporting to senior hierarchical institutions is mostly done through ICT tools, especially Electronic Mail. However, the digital signature is not used at all, documents being printed, signed, scanned and transmitted electronically.

C51: The main communication tools with affiliated institutions are phone and e-mail.

8.1.7. LEGISLATIVE AND NORMATIVE FRAMEWORK

C52: The legal framework for the development of digital competences in Technical Vocational Education is poorly developed and incoherent.

C53: The Framework of Minimum Standards for Digital Competence for Students and Management Staff does not exist or does not fully cover the necessary skills in Technical professional Education.

C54: The legal framework for digital competency training for both management, teachers and students is incomplete and does not, to a large extent, cover the needs of the stakeholders.

C55: There is no legal framework for the digital competences of students required to apply ICT in the areas of expertise.

C56: The digital competence assessment mechanism for both teaching, management and students is impractical, and the existing legal framework does not include mechanisms to motivate the development and application of digital competences in practice.

C57: Minimum equipment standards are out-dated and do not meet the current needs of the TVE.

C58. Minimum equipment standards are of a general nature and do not facilitate the development of ICT skills in specialized fields.

8.2. RECOMMENDATIONS

R1: Approving and implementing the European Digital Competence Standards - DigiCom at all levels: General, for Teachers and Educational Institutions

R2: Introduce digital literacy discipline in the gymnasium cycle, including the formation of basic digital skills.

R3: Compulsory digital literacy exam at the end of the gymnasium and lyceum cycle. Students holding the European Computer Driving License will be released from the exam.

R4: Encourage educational institutions and teachers to respect copyright and related rights in the use of digital teaching materials. Program products should be used in accordance with the type of license that they characterize (open educational resources, free licenses, proprietary licenses, etc.).

R 5 : Create a mechanism for cooperation of educational institutions and their employees in the development of digital methodological.

R 6 : Promote the concept of open educational resources. Encourage educational institutions to focus their efforts on the development of such resources.

R 7 : Create a repository of methodological teaching materials. For this purpose, a National Portal of Technical Vocational Education www.ipt.md or specialized websites could be used, which could be maintained by the centres of excellence in the areas of training.

R 8 : Implement measures that would encourage educational institutions to develop, acquire and use digital teaching materials to train, simulate work-specific activities for prospective graduates.

R 9 : Increase the level of teachers co-ordination activities and institutions as a whole in the field of digital methodological materials, the development of institutional and training plans, avoid duplication. Increase the role of centres of excellence in coordinating and guiding these activities.

R 10 : Support educational institutions to facilitate the development and usage of digital methodological materials for students with special educational needs by providing methodological and technological support from specialists in the area of comprehensive education and endowment of institutions with technical equipment and assisting technologies.

R 11 : Training of teachers and management staff in the area of intellectual property in general, copyright and related ones, in particular.

R 12 : Training of teachers and management in the field of computer-assisting training:

- ✓ The psycho-pedagogical basis of computer-assisting training.
- ✓ Elaborate, design and implement digital teaching materials.
- ✓ Learn Management Systems.
- ✓ Learn content management systems.
- ✓ Digital photography.
- ✓ Audio-video processing techniques.
- ✓ Electronic tests.

R13 : Advocacy in favour of the concept of open educational resources and train teaching and management staff in the specific aspects of the elaboration of such resources.

R14 : Train teaching and management in the area of cooperative tools, on-line security and digital content creation.

R15 : Training of management staff in the area of program usage in human resources management.

R16 : Include methodological materials of the formal elements defining the output data of the digital methodological materials: the institution, the training, the specialty, the course unit, the author, the date of elaboration.

R17 : Ensure compliance of copyright and related ones by indicating external sources in their own editions of digital teaching materials.

R1 8 : Increase the number of interactive multimedia elements in the digital teaching materials and their correlation as closely as possible with the specific professional skills to be developed in students.

R1 9 : Ensure educational and social involvement in digital methodological materials the benefits intended for pupils with special educational needs.

R 20 : Elaborate Minimum Standards of Digital Competence for Management, Managers, Teachers in Specialized Subjects (for each specialization area), Students in Technical Education (for each specialization area)

R 21 : Elaborate a comprehensive digital competence assessment and digital competence assessment mechanism in the management process and / or the EIP process for management staff and TVE teachers respectively.

R 22: Modify Qualification Regulation for Teaching and Management Teachers in TVE by incorporating the obligation of holding the Digital Competence Certificate in the use of ICT in the managerial process and the TLE process for obtaining the attestation. At the same time, minimum standards of competence can be established for each teaching or managerial degree.

R2 3 : Elaboration of a mandatory evaluation mechanism for digital competences of TVE students at the end of the study period.

R2 4 : Update Minimum Standards of ICT equipment endowment of Technical Vocational Education Institutions and link them to EU Standards. Include Minimum Standards for endowment of program products for the management of human resources.

R2 5 : Elaborate Minimum Equipment Standards with the necessary equipment for the application of ICT in the field of specialization (for each specialization field).

R2 6 : Develop a model for web pages of TVE institutions.

R2 7 : Regulate the usage of corporate electronic addresses by all employees of TVE institutions.

R2 8 : Set up a minimum guaranteed budget included in the TVE budget of the institutions to be allocated annually in ICT equipment.

R2 9 : Establish a financial support stipulated in normative act or TVE institutions for the purchase of ICTs, adjusted to the ESET students' needs.

R 30 : Establish a mechanism to regulate the work of teachers who develop digital resources. Establish norms in time to assure pupils with digital teaching resources.

R 31 : Review the concept of teaching-learning-evaluating processes in computer science.

8.2.1. RECOMMENDATION ON THE MOTIVATION OF THE MANAGEMENT OF THE INSTITUTIONS FOR THE INTEGRATION OF ICT IN VET

R1: Modification of the regulations for the attestation of the leading cadres in pre-school, primary, special, complementary, secondary and specialized education (Order ME 454/2012), by including compulsory courses of continuous training in the field of ICT use in the managerial process.

R2: Modifying and adjusting quality standards for external evaluation of VET institutions by including criteria related to technical endowments, the use of ICT in the Teaching-Learning process, the use of ICT in educational management, and the rate of students holding the European Computer Driving License.

R3: Modification of the regulations for the attestation of the leading cadres in pre-school, primary, special, complementary, secondary and specialty education (Order ME 454/20120), by condition of obtaining the Management Degree II with the holding of the European Computer Driving License. In the cases of Managerial Level I and Higher, the ECDL certificate will be of the average and higher level respectively.

R4: Modification of the regulations for attestation of teachers in general, technical and psychological pedagogical services (Oridnul ME 62/2018) by including compulsory courses of in-service teacher training in the field of ICT use in the TLE process. Recomandări privind standardele de dotare tehnică a unei săli de clasă din ÎPT

8.2.2. RECOMMENDATIONS ON STANDARDS FOR THE TECHNICAL FEEDING OF A CALSSROOM IN VET INSTITUTIONS

TABLE 21. MINIMUM EQUIPMENT FOR A CALSSROOM IN VETINSTITUTIONS

N/O	GENERAL CLASSROOM		CLASSROOM FOR TEACHING SPEICALITY	
	Equipment	Quantity	Equipment	Quantity
1	Laptop (Procesor i5 or similar, RAM 8 GB, HHD 1 TB)	31 (1 for teacher)	Laptop (Procesor i5 or similar, RAM 8 GB, HHD 1 TB)	31 (1 for teacher)
2	Non-color printer	1	Non-color printer	1
3	Projector	1	Projector	1
4	Interactive whiteboard	1	Interactive whiteboard	1
5	Software type Microsoft Office 365 or similar	31(licenses)	Software type Microsoft Office 365 or similar	31(licenses)
6	Wi-fi 100%	50 mb/s	Laptop (Procesor i5 sau similar, RAM 8 GB, HHD 1 TB)	50 mb/s
7			Specialized programs for computer assisted design	31(licenses)
8			Specialized software for computer simulation	31(licenses)
9	Common server for the entire institution to which all computers in all classes are connected			Common server for the entire institution to which all computers in all classes are connected

8.2.3. RECOMMENDATIONS ON THE DIGITAL COMPETENCES REQUIRED FOR THE TEACHING FOR THE IMPLEMENTATION OF ICT IN THE TEACHING-LEARNING-EVALUATION PROCESSE

TABELUL 22 TYPES OF DIGITAL COMPETENCES RELEVANT TO THE TEACHERS FROM VET

N/O	TIPUL DE COMPETENȚĂ	RELEVANȚA
1	Collaboration and communication tools (Drive, Dropbox, etc.)	Very High
2	Use of digital multimedia tools in the TLE process	Very High
3	Creating digital content, including interactive electronic presentations	Very High
4	Advanced work tools in text documents, spreadsheets and electronic presentations	High

N/O	TIPUL DE COMPETENȚĂ	RELEVANȚA
5	Slang and IT vocabulary	High
6	General Principles of 21st Century Education	High
7	Video Lessons	High
8	Security in on-line environment	Medium
9	Global educational trends	Medium
10	Legal and strategical framework in education	Medium

8.2.4. RECOMMENDATIONS REGARDING THE ENHANCEMENT OF THE ACCESS OF PUPILS WITH SEPAND FORM DEFAVORISING FAMILIES TO VET

R1: Elaboration and approval of minimum standards for endowment with ICT equipment for students with ESCs with different forms of disability.

R2: Elaboration and implementation of a campaign to promote technical professions among girls - Girls go to VET.

R3: Implementing the "One Laptop for Every Learner" Program - National Support Program for Students in Disadvantaged Families to Purchase a Laptop.

R4: Elaborate minimum standards for technical endowment of VET institutions needed to ensure distance learning.