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# Inclusion and digital skills. Strategic priorities for the development of digital competences of special education teachers

# Inclusione e competenze digitali. Priorità strategiche per lo sviluppo delle competenze digitali degli insegnanti di sostegno

*di*

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**Abstract:**

Digital skills currently play a fundamental epidiptic role in the ability of education systems to renew themselves and actively project future generations into an increasingly medial anthropic reality within a process of evolution which globally affects the whole of society. The multifaceted applications of digital skills possessed by special education teachers become facilitators in teaching practices geared to pupils with special educational needs (SEN) and create fertile learning contexts through which to achieve the process of inclusion that the school and the entire community must strive for. In the perspective of this consolidation, this article, based on a research conducted on a sample of 1.300 teachers specialised in teaching support activities (TFA cycle VI), for primary and secondary school, to whom the questionnaire for surveying levels of knowledge, skills and digital competences "DigiComp 2. 2", intends to propose a structured model that highlights the strategic priorities for

continuous and permanent training aimed at providing support teachers with innovative methodologies and tools, based on the use of technologies and digital devices, such as to realise, within the different educational contexts, inclusive didactic routes.

**Keywords:** Digital skills; Inclusion; DigiComp 2.2; Special Educational Needs; Teacher training.

**Abstract:**
Le competenze digitali rivestono oggi un ruolo epidittico fondamentale nella capacità dei sistemi di istruzione di rinnovarsi e proiettare attivamente le future generazioni in una realtà antropica sempre più mediale all'interno di un processo di evoluzione che investe in modo globale tutta la società. Le multiformi applicazioni delle competenze digitali in possesso dei docenti di sostegno diventano facilitatori nelle prassi didattiche calibrate sugli alunni con Bisogni Educativi Speciali e realizzano dei contesti d'apprendimento fertili attraverso cui realizzare quel processo di inclusione a cui la scuola e l'intera comunità devono tendere. Nella prospettiva di tale consolidamento, il presente articolo, basandosi su una ricerca condotta su un campione di 1.300 docenti specializzati sulle attività di sostegno didattico (TFA VI ciclo), per il primo ed il secondo ciclo di istruzione, a cui è stato somministrato il questionario di rilevazione dei livelli di conoscenze, abilità e competenze digitali "DigiComp 2.2", vuole proporre un modello strutturato che evidenzi le priorità strategiche per una formazione continua e permanente rivolta a fornire ai docenti di sostegno metodologie e strumenti innovativi, fondati sull'utilizzo delle tecnologie e del digitale, tali da realizzare, all'interno dei diversi contesti educativi, itinerari didattici inclusivi.

**Parole chiave:** Competenze digitali; Inclusione; DigiComp 2.2; Bisogni Educativi Speciali; Formazione docenti.

## 1. Introduction[1]

The continuous renewal of the Italian education system, with the succession of reforms, also through the latest effects produced by the Covid-19 pandemic, is an epitome of its variegated and multiform situation; the strategic priorities and related planning have dictated the times. Sometimes the purposes have progressed faster than their implementation process, often producing a temporal dyscrasia and profound organizational difficulties.

Following Law 107/2015, the so-called Good School, the state of the art shows us how teacher training is identified as a priority. The education system requires increasingly professional figures: it is required by Europe and by the society we live in. Even if training for the teaching staff has now become continuous and compulsory (Article 1 paragraph 124), it is poorly structured, proposals are developed, but a conscious and targeted organicity is lacking. In the framework just described, however, we can focus on two relevant sectors within the European recommendations for key competences: digital competence and social inclusion. The effort made by the European community through the allocation of funds for digital innovation and young people's full realization, the Next Generation EU, seems to be moving in this direction.

1 The manuscript is the result of a collective work of the authors, the specific contribution of which is to be referred to as follows: introduction (1), paragraphs 3, and conclusions are attributed to Massimiliano Lo Iacono; paragraphs 2 and conclusions are attributed to Cristiana Cardinali.

The digital transition has always been difficult to implement in the Italian territory, where socio-economic gaps and the different structural management place strong limits to the expansion and implementation. Also through the PNRR funds, the government is financing numerous investments to encourage the use of digital technology in schools, prefiguring the increase in innovative teaching practices through new technologies.
While the radical introduction of digital tools in schools has been encouraged only in recent years, a great attention has been paid for many decades to the world of disability and school inclusion. The numerous specific laws - such as the Framework Law 104/92, the C.M. of 28 December 2012, Legislative Decree 66/2017 as amended by Legislative Decree 96/2019, the D.I. 182/2020, introducing the ICF-based Individualized Educational Plan - show how the Italian education system has been very attentive to the development of inclusive training courses within the entire school community; for many years the priority has been the full development of the individual through the enhancement of diversity.
In this context, Italy proves to be at the forefront in the promotion of educational paths for pupils with special educational needs. The representation of reality is therefore that, if on the one hand, the inclusive teaching methodologies are now consolidated in the educational practices of the Italian national education system, on the other hand the use of digital tools within these practices is still lagging behind, in a phase of primordial expansion (Cottini, 2014).
In the PNSD - National Plan for Digital Education (MIUR, 2015), we can trace a great systemic effort to accelerate media practice, a valid planning to enhance digital in the world of education through two fundamental directives. They are the strengthening of schools' tools and infrastructures and the training of school staff to use them and to develop, through them, innovative and engaging teaching methodologies. Thus, the digital is not only as a teaching methodology, but also a transmission of competence for an active and conscious digital citizenship (Pasta & Rivoltella, 2022). Furthermore, focusing on the acquisition of structured digital skills means activating facilitators in the didactic practices calibrated on pupils with special educational needs, and produces the creation of fertile learning contexts which enhance that process of inclusion the schools and the entire educating community must tend to (Calvani et al. 2010).
The present work aims to trace how deep this dyscrasia is, how much and how it is necessary to invest in training and to which extent this can affect the educational development of pupils with special educational needs in an inclusive perspective. The research, conducted on a sample of 1300 teachers specialised in teaching support activities, aims to propose a structured model highlighting the strategic priorities for continuous and permanent training, to provide special education teachers with innovative methodologies and tools, based on the use of technologies and digital tools, so as to create inclusive educational itineraries within the different educational contexts.

## 2. Teachers' digital competences

The concept of digital competence can be defined as a set of skills to use technology to effectively optimise our daily lives (Ferrari, 2013), intended as "the safe, critical and responsible use of information society technologies for work, entertainment and education" (European Commission, 2018, p. 9). It has often been frequently referred to by researchers and proposed in policy debates. In the recommendation on key competences for lifelong learning proposed by the European Commission (2006), digital competence was identified as one of the eight key competences for life. New policies and documents introduced in various countries illustrate the importance given to technology and

digital skills. After considering digital competence as one of the eight key competences for life, the European Commission developed DigComp (the European Digital Competence Framework) as a framework to explain what it means to be 'digitally competent'. Identifying the inadequate level of digital competence of EU citizens, Digcomp was created to identify the digital competence of EU citizens and become a tool to improve and sustain digital competence. Specifically, five components of digital competence were presented: 1) information and data literacy; 2) communication and collaboration; 3) digital content creation; 4) security; 5) problem solving (Carretero et al., 2017; Vuorikari et al., 2016). The Digcomp is also available in updated versions according to developments in the community. The process of creating DigComp began in 2013 with the publication of DigComp 1.0 whose structure consisted of 5 dimensions: areas of competence, competences, levels of mastery, examples of knowledge, skills and attitudes, and examples of application in various contexts; it identified two competences divided between the various areas; it defined 3 levels of mastery (basic, intermediate, advanced). In DigComp 2.0. (2016), the names of the 5 competence areas were redefined and the 21 competences were reviewed.The work that led to DigComp 2.1 (2017) instead focused on the proficiency levels, which were increased from 3 to 8 by adding an advanced level to the previous three and then dividing each level into 2 sub-levels (Figg. 1/2).

With the aim of developing dimension 4 of the framework, the knowledge, skills and attitudes dimension, we arrived at the current version of DigComp 2.2 (2022), which offers a complete and self-consistent version of the framework with a detailed description of all five dimensions (Fig. 3). DigComp has now been adopted at European and Italian level as the reference system for digital competences, offering a comprehensive and multidimensional view of the concept of competence, which, in line with European documents, is defined as the combination of knowledge, skills and attitudes. Knowledge is composed of facts and figures, concepts, ideas and theories that are already established and provide the basis for understanding a certain field or topic; skills are understood as knowing and being able to perform processes and apply existing knowledge in order to obtain results; attitudes describe the disposition and mindset to act or react to ideas, people or situations.

In recently, also as a result of the Covid-19 pandemic, digital competence has assumed a strong prominence in the educational field (Tejada & Pozos, 2018; Cabero et al., 2020) and the need for teachers to have didactic and technological knowledge that enables them to make use of digital technologies in their professional practice is emphasised. Durán (2019) also highlights that teachers' digital competence is a set of knowledge, skills and attitudes necessary for a teacher to make effective use of ICTs in its different aspects (technological, informational, multimedia, communicative, collaborative and ethical), assuming pedagogical-didactic criteria for an effective integration of ICTs in their educational practice and, in general, in any formal or non-formal situation. In this regard, Castañeda et al. (2018) affirm that teachers' digital competence must be holistic, situated, systemic, trainable and constantly developing and, moreover, likely to integrate the skills, attitudes and knowledge that teachers need to support their students' learning as active participants in a digital world (Domingo et al., 2020). However, while the availability of educational hardware and software is widespread, the use of these digital tools in teaching practice, as well as digital competence in general, is still uneven among teachers. Several studies have found that individual characteristics of teachers, such as their beliefs, attitudes, motivations and perceived self-efficacy, have a much greater weight in explaining the use of technology in schools than the amount and access to technological infrastructure (Backfisch et al., 2021; Gil-Flores et al., 2017; Tondeur et al., 2008; Valtonen et al.,

2015). Therefore, the importance of teachers' knowledge, skills and attitudes in influencing teachers' use of digital technology is currently recognised (Sailer et al., 2021).
The same reflection can be extended to the training of future teachers on inclusion and attention to diversity. According to Mendez et al. (2022), despite the gloomy outlook that emerges from the analysis of basic teacher training in terms of both digital skills and the effective application of the principle of inclusion, the scientific literature makes it possible to confirm, on the one hand, that the scientific community is indeed interested in this phenomenon (López et al., 2020) and, on the other, that some experiences and studies value the role that technology can play in attention to diversity. In general, it is noteworthy that the need to promote continuous training in this area is explicitly mentioned (Cabero-Almenara et al., 2022) due to the low level of teachers' knowledge of how to use information and communication technologies to promote inclusion (Fernández-Batanero et al., 2022). The recognition of digital competence therefore shifts the responsibility to the school environment to foster the development of truly inclusive teaching.

## 3. Research

### 3.1 Tools

The research provided for the administration of the DigComp 2.2 questionnaire on digital knowledge, skills and competences, as required by the European standards for digital citizenship (Vuorikari et al., 2022). Within the development of the questionnaire 5 areas/dimensions of relevance can be traced. They are linked to distinct aspects of digital competence (Fig. 1) and divided into subsections

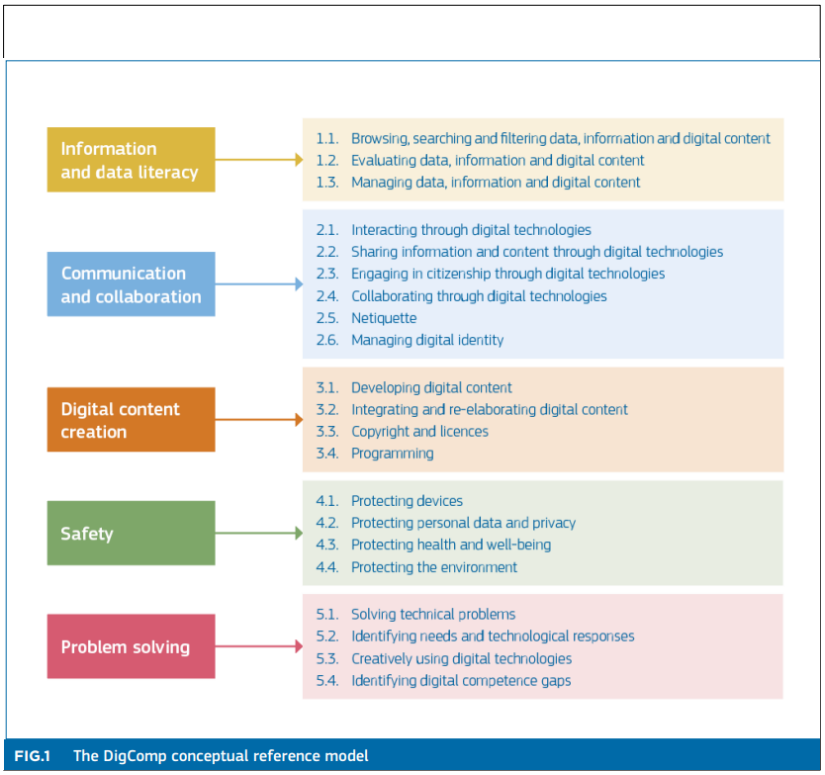

FIG.1 The DigComp conceptual reference model

Each of them can be attributed a competence self-assessment, based on a spectrum of 8 levels (Fig. 2) Foundation 1-2, Intermediate 3-4, Advanced 5-6, Highly specialised 7/8:

DigComp Levels

T.4 **Main keywords that feature the proficiency levels**

| 4 OVERALL LEVELS | Foundation | | Intermediate | | Advanced | | Highly specialised | |
|---|---|---|---|---|---|---|---|---|
| 8 GRANULAR LEVELS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| COMPLEXITY OF TASKS | Simple task | Simple task | Well-defined and routine tasks, and straightforward problems | Tasks, and well-defined and non-routine problems | Different tasks and problems | Most appropriate tasks | Resolve complex problems with limited solutions | Resolve complex problems with many interacting factors |
| AUTONOMY | With guidance | Autonomy and with guidance when needed | On my own | Independent and according to my needs | Guiding others | Able to adapt to others in a complex context | Integrate to contribute to the professional practice and to guide others | Propose new ideas and processes to the field |
| COGNITIVE DOMAIN | Remembering | Remembering | Understanding | Understanding | Applying | Evaluating | Creating | Creating |

Fig. 2 - Levels

The various levels intercept knowledge, skills and attitude, correlated with the different competences within the DigComp and with the different levels of mastery (Fig. 3). In the DigComp 2.2 new examples are integrated, subdivided for each specific dimension and competence, but the structure and general subdivision are not changed.

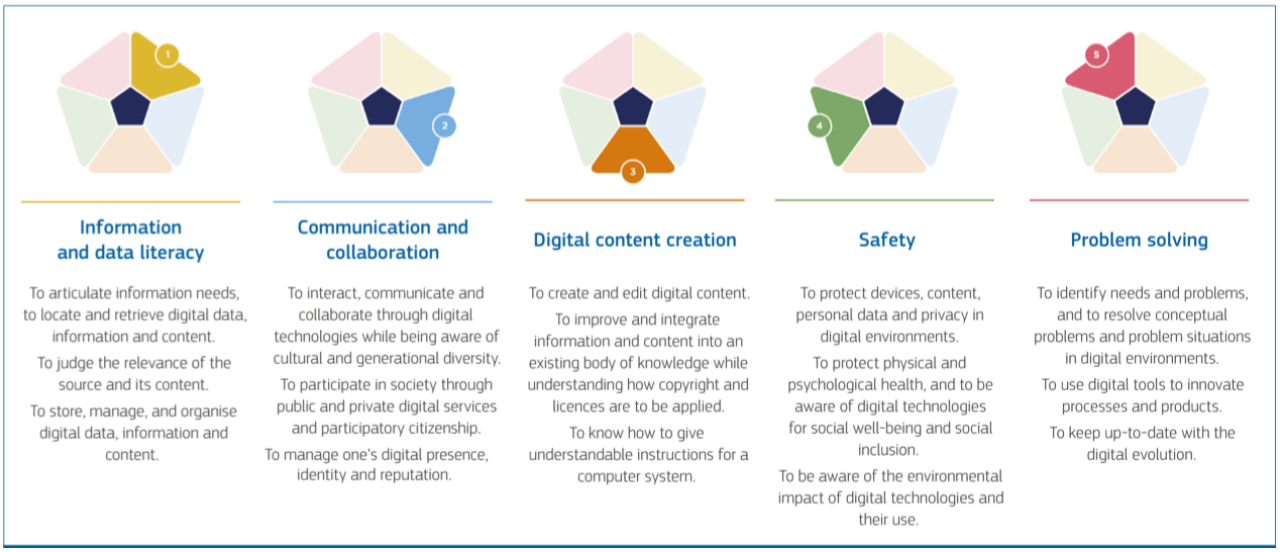


Fig. 3 - Knowledge, skills and attitude

The questionnaire was administered through a Google Form; the structure included a preliminary survey in the first part and a second part divided into 5 sections, one for each dimension of the DigComp. Each section re-proposed the self-assessment questions relating to all the 21 competences. The evaluation grid was divided into values from 1 to 8 (from Foundation 1 to high specialized 8) as indicated in Figure 2. Finally, the sample was given all the questions relating to all the competences. However, only those most statistically relevant and most pertinent to research and innovative teaching methodologies have been reported in the following analysis.

### 3.2 Sample

The research was conducted on a sample of 1313 special education teachers at the end of their specialisation course (Tab. 1). Each teacher anonymously answered to the proposed questionnaire. 61% were already working in educational institutions, in the order and grade related to their specialisation. The sample is made up of 17% of male teachers and 83% of female teachers. Almost 50% relates to secondary school teachers, 37% to lower secondary and the remaining 13% relates to primary school. Furthermore, the most representative age group is the 36/45 age range and constitutes about 45% of the sample. 34% are between 23/35 years, 19% between 46/55 years; finally, a remaining 2% includes those over 55. Finally, the sample is geographically located throughout the country, since the courses relating to the special education teachers' specialisation path (VI Cycle) were delivered online, due to the persistence of the Covid-19 pandemic restrictive measures.

| | | | total | gender | | age | | | | School types | | | Teaching experience | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | sample total | male | famele | 23-35 | 36-45 | 46-55 | Over 55 | Primary | Secondary I grade | Secondary II grade | Yes | No |
| SCHOOL TEACHER | Primary | % | 13,8% | 4,0% | 15,8% | 1,8% | 16,9% | 26,1% | 34,6% | 100,0% | 0,0% | 0,0% | 19,4% | 4,9% |
| | Secondary I grade | % | 37,2% | 49,1% | 34,8% | 45,6% | 35,1% | 27,3% | 34,6% | 0,0% | 100,0% | 0,0% | 41,5% | 30,5% |
| | Secondary II grade | % | 49,0% | 46,9% | 49,4% | 52,7% | 48,0% | 46,5% | 30,8% | 0,0% | 0,0% | 100,0% | 39,1% | 64,6% |
| | **Total** | **N.** | **1.313** | **226** | **1.087** | **452** | **590** | **245** | **26** | **181** | **489** | **643** | **804** | **509** |
| GENDER | Male | % | 17,2% | 100,0% | 0,0% | 18,4% | 15,4% | 17,6% | 34,6% | 5,0% | 22,7% | 16,5% | 18,7% | 14,9% |
| | Female | % | 82,8% | 0,0% | 100,0% | 81,6% | 84,6% | 82,4% | 65,4% | 95,0% | 77,3% | 83,5% | 81,3% | 85,1% |
| | **Total** | **N.** | **1.313** | **226** | **1.087** | **452** | **590** | **245** | **26** | **181** | **489** | **643** | **804** | **509** |
| AGE | 23-35 | % | 34,4% | 36,7% | 33,9% | 100,0% | 0,0% | 0,0% | 0,0% | 4,4% | 42,1% | 37,0% | 30,2% | 41,1% |
| | 36-45 | % | 44,9% | 40,3% | 45,9% | 0,0% | 100,0% | 0,0% | 0,0% | 55,2% | 42,3% | 44,0% | 45,1% | 44,6% |
| | 46-55 | % | 18,7% | 19,0% | 18,6% | 0,0% | 0,0% | 100,0% | 0,0% | 35,4% | 13,7% | 17,7% | 21,9% | 13,6% |
| | Over 55 | % | 2,0% | 4,0% | 1,6% | 0,0% | 0,0% | 0,0% | 100,0% | 5,0% | 1,8% | 1,2% | 2,7% | 0,8% |
| | **Total** | **N.** | **1.313** | **226** | **1.087** | **452** | **590** | **245** | **26** | **181** | **489** | **643** | **804** | **509** |
| TEACHING EXPERIENCE | Yes | % | 61,2% | 66,4% | 60,2% | 53,8% | 61,5% | 71,8% | 84,6% | 86,2% | 68,3% | 48,8% | 100,0% | 0,0% |
| | No | % | 38,8% | 33,6% | 39,8% | 46,2% | 38,5% | 28,2% | 15,4% | 13,8% | 31,7% | 51,2% | 0,0% | 100,0% |
| | **Total** | **N.** | **1.313** | **226** | **1.087** | **452** | **590** | **245** | **26** | **181** | **489** | **643** | **804** | **509** |

Tab. 1 - Sample

### 3.3 Data analysis

Data analysis was carried out using spss software.

The first area of investigation is Area 1: Information and data literacy. Competence 1.1 "Browsing, searching and filtering data, information and digital content" represents the first competence step of digital citizenship, to articulate information needs, to search for data, information and content in digital environments, to access them and to navigate between them. To create and update personal search strategies.

Possessing this competence is fundamental for special education teachers who research and promote calibrated and innovative teaching strategies and solutions through the network. The following diagram (Tab. 2) shows the distribution of the sample in relation to the diverse levels of competence possessed:

| | | | total | gender | | age | | | | school types | | | In-service teacher | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | total sample | Male | Female | 23-35 | 36-45 | 46-55 | Over 55 | Primary | Lower Secondary | Upper Secondary | Yes | No |
| 1.1 BROWSING, SEARCHING AND FILTERING DATA, INFORMATION AND DIGITAL CONTENT | Statistics | N | 1.313 | 226 | 1.087 | 452 | 590 | 245 | 26 | 181 | 489 | 643 | 804 | 509 |
| | | mean | 5,75 | 6,13 | 5,67 | 6,13 | 5,71 | 5,32 | 4,15 | 5,17 | 5,95 | 5,76 | 5,75 | 5,74 |
| | | median | 6 | 6 | 6 | 6 | 6 | 6 | 4 | 5 | 6 | 6 | 6 | 6 |
| | | mode | 6 | 6 | 6 | 6 | 6 | 6 | 3 | 6 | 6 | 6 | 6 | 6 |
| | | std. Deviation | 1,54 | 1,37 | 1,56 | 1,33 | 1,54 | 1,65 | 1,76 | 1,76 | 1,49 | 1,47 | 1,60 | 1,44 |
| | | std. e. m. | 0,04 | 0,09 | 0,05 | 0,06 | 0,06 | 0,11 | 0,35 | 0,13 | 0,07 | 0,06 | 0,06 | 0,06 |
| | | max | 8 | 8 | 8 | 8 | 8 | 8 | 7 | 8 | 8 | 8 | 8 | 8 |
| | | min | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 |
| | | range (max-min) | 7 | 6 | 7 | 6 | 7 | 7 | 6 | 7 | 7 | 6 | 7 | 7 |
| | **SPECIALISED** | **%** | **32,4%** | **41,6%** | **30,5%** | **41,6%** | **30,7%** | **21,6%** | **15,4%** | **24,9%** | **37,6%** | **30,6%** | **34,1%** | **29,9%** |
| | 8 | % | 13,3% | 17,7% | 12,4% | 15,5% | 13,1% | 11,4% | 0,0% | 9,9% | 15,3% | 12,8% | 14,1% | 12,2% |
| | 7 | % | 19,1% | 23,9% | 18,1% | 26,1% | 17,6% | 10,2% | 15,4% | 14,9% | 22,3% | 17,9% | 20,0% | 17,7% |
| | **ADVANCED** | **%** | **44,8%** | **43,4%** | **45,1%** | **45,6%** | **45,1%** | **45,3%** | **19,2%** | **36,5%** | **44,6%** | **47,3%** | **41,7%** | **49,7%** |
| | 6 | % | 31,2% | 31,4% | 31,1% | 31,2% | 32,2% | 30,6% | 11,5% | 22,7% | 31,9% | 33,0% | 30,8% | 31,6% |
| | 5 | % | 13,6% | 11,9% | 14,0% | 14,4% | 12,9% | 14,7% | 7,7% | 13,8% | 12,7% | 14,3% | 10,8% | 18,1% |
| | **INTERMEDIATE** | **%** | **20,1%** | **14,6%** | **21,3%** | **11,7%** | **21,9%** | **28,2%** | **50,0%** | **32,6%** | **15,7%** | **19,9%** | **20,8%** | **19,1%** |
| | 4 | % | 14,4% | 11,5% | 15,0% | 9,5% | 16,1% | 18,4% | 23,1% | 19,3% | 11,5% | 15,2% | 14,8% | 13,8% |
| | 3 | % | 5,7% | 3,1% | 6,3% | 2,2% | 5,8% | 9,8% | 26,9% | 13,3% | 4,3% | 4,7% | 6,0% | 5,3% |
| | **FOUNDATION** | **%** | **2,7%** | **0,4%** | **3,1%** | **1,1%** | **2,4%** | **4,9%** | **15,4%** | **6,1%** | **2,0%** | **2,2%** | **3,5%** | **1,4%** |
| | 2 | % | 2,1% | 0,4% | 2,4% | 1,1% | 1,5% | 4,1% | 11,5% | 4,4% | 1,0% | 2,2% | 2,9% | 0,8% |
| | 1 | % | 0,6% | 0,0% | 0,7% | 0,0% | 0,8% | 0,8% | 3,8% | 1,7% | 1,0% | 0,0% | 0,6% | 0,6% |

Tab. 2 - Dimension 1, competence 1.1

The first relevant fact is that the ratio between the sample in the gender difference and the level of competence acquired is misaligned in all levels of competence except for the advanced. If on the one hand male teachers have higher percentages in the high levels of proficiency (32.4 % specialised and 44.8% advanced) whose NET of the 5/8 levels is 85.0% and lower in the intermediate (20.1%) and foundation (0.4%) levels (NET 15.0%), on the other hand the value of women shows a similar trend for the Advanced range but obtains higher values in the intermediate range (21.3%) and in the basic range (3.1%) as opposed to 0.4 for men.
Another relevant fact is the inversely proportional trend between the level of competence and the increase in the age of the sample. In fact, in the intermediate and based ranges the NET of the levels is 65.4%, with a 26.9% peak value at level 3.
Finally, it is noticeable how the levels of proficiency are inversely proportional to the order and grade of school in which the teachers work. In the specialised level, the gap between lower secondary and primary school is almost 13 percentage points; in the advanced level the difference between the maximum (upper secondary 47.3%) and primary (36.5%) is almost 12 percentage points; finally, in the intermediate and basic level, primary school teachers always exceed the other two school grades in percentage terms, with a range of 12.7% for the ¾ level and 4 percentage points for the foundation level. Finally, it should be underlined that for upper secondary school, the foundation 1 competence value is 0.0%.
The next chart (Tab.3) refers to competence 1.2 “Evaluating Data, Information And Digital Content”; within the information & data literacy competence, competence 1.2 refers to knowing how to analyse, compare and critically evaluate the credibility and reliability of sources of data, information and digital content. This indicates the special education teacher’s ability to know how to evaluate the contents traced on the web, to use them as tools and didactic paths relevant to their pupil’s special educational needs.

| | | | total | gender | | age | | | | school types | | | In-service teacher | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | total sample | Male | Female | 23-35 | 36-45 | 46-55 | Over 55 | Primary | Lower Secondary | Upper Secondary | Yes | No |
| 1.2 EVALUATING DATA, INFORMATION AND DIGITAL CONTENT | Statistics | N | 1.313 | 226 | 1.087 | 452 | 590 | 245 | 26 | 181 | 489 | 643 | 804 | 509 |
| | | mean | 5,66 | 6,07 | 5,57 | 6,00 | 5,63 | 5,23 | 4,46 | 5,10 | 5,81 | 5,70 | 5,66 | 5,65 |
| | | median | 6 | 6 | 6 | 6 | 6 | 5 | 4 | 5 | 6 | 6 | 6 | 6 |
| | | mode | 6 | 6 | 6 | 6 | 6 | 6 | 3 | 6 | 6 | 6 | 6 | 6 |
| | | std. Deviation | 1,50 | 1,29 | 1,53 | 1,31 | 1,51 | 1,62 | 1,84 | 1,71 | 1,45 | 1,45 | 1,54 | 1,44 |
| | | std. e. m. | 0,04 | 0,09 | 0,05 | 0,06 | 0,06 | 0,10 | 0,36 | 0,13 | 0,07 | 0,06 | 0,05 | 0,06 |
| | | max | 8 | 8 | 8 | 8 | 8 | 8 | 7 | 8 | 8 | 8 | 8 | 8 |
| | | min | 1 | 3 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | range (max-min) | 7 | 5 | 7 | 6 | 7 | 7 | 6 | 7 | 7 | 7 | 7 | 7 |
| | **SPECIALISED** | **%** | **29,8%** | **38,5%** | **28,0%** | **35,6%** | **29,0%** | **22,0%** | **19,2%** | **23,8%** | **32,7%** | **29,2%** | **31,1%** | **27,7%** |
| | 8 | % | 10,8% | 14,2% | 10,1% | 12,4% | 11,0% | 8,6% | 0,0% | 7,7% | 11,7% | 11,0% | 11,2% | 10,2% |
| | 7 | % | 19,0% | 24,3% | 17,8% | 23,2% | 18,0% | 13,5% | 19,2% | 16,0% | 21,1% | 18,2% | 19,9% | 17,5% |
| | **ADVANCED** | **%** | **46,9%** | **47,3%** | **46,8%** | **50,2%** | **47,1%** | **42,9%** | **23,1%** | **35,9%** | **48,1%** | **49,1%** | **44,8%** | **50,3%** |
| | 6 | % | 30,7% | 33,2% | 30,2% | 35,4% | 29,5% | 26,1% | 19,2% | 22,1% | 32,1% | 32,0% | 30,1% | 31,6% |
| | 5 | % | 16,2% | 14,2% | 16,7% | 14,8% | 17,6% | 16,7% | 3,8% | 13,8% | 16,0% | 17,1% | 14,7% | 18,7% |
| | **INTERMEDIATE** | **%** | **20,6%** | **14,2%** | **22,0%** | **13,5%** | **21,0%** | **30,2%** | **46,2%** | **33,7%** | **17,6%** | **19,3%** | **20,9%** | **20,2%** |
| | 4 | % | 14,5% | 11,1% | 15,2% | 9,7% | 15,4% | 20,4% | 19,2% | 20,4% | 11,9% | 14,8% | 14,6% | 14,3% |
| | 3 | % | 6,2% | 3,1% | 6,8% | 3,8% | 5,6% | 9,8% | 26,9% | 13,3% | 5,7% | 4,5% | 6,3% | 5,9% |
| | **FOUNDATION** | **%** | **2,7%** | **0,0%** | **3,2%** | **0,7%** | **2,9%** | **4,9%** | **11,5%** | **6,6%** | **1,6%** | **2,3%** | **3,2%** | **1,8%** |
| | 2 | % | 2,3% | 0,0% | 2,8% | 0,7% | 2,5% | 4,1% | 7,7% | 6,1% | 1,2% | 2,0% | 2,9% | 1,4% |
| | 1 | % | 0,4% | 0,0% | 0,5% | 0,0% | 0,3% | 0,8% | 3,8% | 0,6% | 0,4% | 0,3% | 0,4% | 0,4% |

Tab.3 - Dimension 1, Competence 1.2

From the data analysis, a misalignment can be highlighted also in this competence, as regards the possession of competence in relation to gender, except for the advanced level, in which the values are almost similar (47.3 males and 46.9 females). It can be noted that the basic level in both values (1-2) results in 0.0% for males.

In relation to age, on the other hand, it is evident that, as for the high competence levels, values show a regular decreasing trend: from 35.6% in the 23/35 age range to 19.2% in the over 55 age range, for

the specialized level; from 50.2% to 23.1% for the advanced level. The situation is completely reversed for the lower competence levels: the intermediate level goes from 13.5% for the youngest to 46.2% for the over 55s, and the foundation level goes from 0.7% to 11.5%. In a certain sense, this competence is markedly difficult to possess with increasing age, as shown in representative graph (fig. 4):

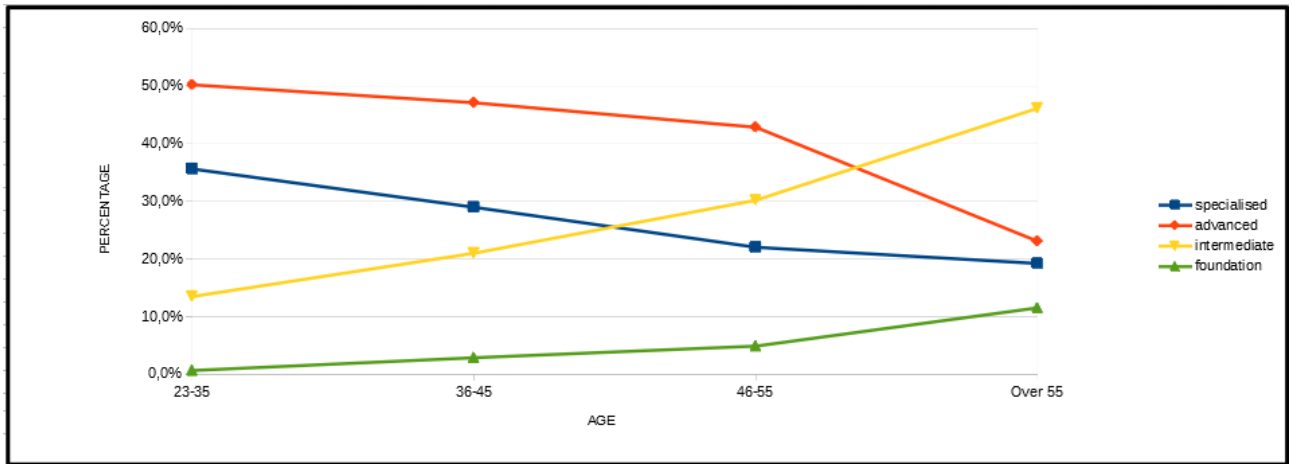


Fig. 4 - Competence 1.2 and age

The last competence of the area is 1.3 "Managing Data, Information And Digital Content". It refers to the ability to organize, store and retrieve data, information, and content in digital environments. To organize and process them in a structured environment.
In the chart (Tab.4) the maximum peak of competence is found in the age between 23/35 years, with an advanced competence of almost 50%. In general, advanced competence concerns all age groups except for the over 55s, whose maximum competence refers to an intermediate level and stands at 50%. With reference to the school order, the maximum values are always in the advanced competence level range. Finally, also for this competence 0.0% of basic competence is registered for the male gender.

| | | | total | gender | | age | | | | school types | | | In-service teacher | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | total sample | Male | Female | 23-35 | 36-45 | 46-55 | Over 55 | Primary | Lower Secondary | Upper Secondary | Yes | No |
| 1.3 MANAGING DATA, INFORMATION AND DIGITAL CONTENT | Statistics | N | 1.313 | 226 | 1.087 | 452 | 590 | 245 | 26 | 181 | 489 | 643 | 804 | 509 |
| | | mean | 5,72 | 6,08 | 5,65 | 6,03 | 5,71 | 5,32 | 4,42 | 5,17 | 5,87 | 5,77 | 5,72 | 5,72 |
| | | median | 6 | 6 | 6 | 6 | 6 | 6 | 4 | 5 | 6 | 6 | 6 | 6 |
| | | mode | 6 | 6 | 6 | 6 | 6 | 6 | 4 | 6 | 6 | 6 | 6 | 6 |
| | | std. Deviation | 1,48 | 1,32 | 1,51 | 1,29 | 1,48 | 1,62 | 1,81 | 1,69 | 1,43 | 1,43 | 1,53 | 1,41 |
| | | std. e. m. | 0,04 | 0,09 | 0,05 | 0,06 | 0,06 | 0,10 | 0,36 | 0,13 | 0,06 | 0,06 | 0,05 | 0,06 |
| | | max | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| | | min | 1 | 3 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | range (max-min) | 7 | 5 | 7 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| | **SPECIALISED** | **%** | **31,5%** | **40,3%** | **29,7%** | **36,5%** | **32,0%** | **22,9%** | **15,4%** | **24,3%** | **34,4%** | **31,4%** | **32,6%** | **29,9%** |
| | 8 | % | 10,8% | 15,0% | 9,9% | 13,1% | 10,0% | 9,4% | 3,8% | 6,6% | 12,3% | 10,9% | 11,3% | 10,0% |
| | 7 | % | 20,7% | 25,2% | 19,8% | 23,5% | 22,0% | 13,5% | 11,5% | 17,7% | 22,1% | 20,5% | 21,3% | 19,8% |
| | **ADVANCED** | **%** | **46,2%** | **45,1%** | **46,5%** | **49,3%** | **45,3%** | **45,3%** | **23,1%** | **37,6%** | **47,2%** | **47,9%** | **44,8%** | **48,5%** |
| | 6 | % | 31,2% | 29,6% | 31,6% | 35,2% | 29,8% | 28,6% | 19,2% | 24,9% | 32,5% | 32,0% | 31,0% | 31,6% |
| | 5 | % | 15,0% | 15,5% | 14,9% | 14,2% | 15,4% | 16,7% | 3,8% | 12,7% | 14,7% | 15,9% | 13,8% | 16,9% |
| | **INTERMEDIATE** | **%** | **19,6%** | **14,6%** | **20,7%** | **13,7%** | **20,2%** | **26,1%** | **50,0%** | **32,0%** | **16,8%** | **18,4%** | **19,0%** | **20,6%** |
| | 4 | % | 14,4% | 11,5% | 15,0% | 10,6% | 15,3% | 18,0% | 26,9% | 19,9% | 11,7% | 14,9% | 13,8% | 15,3% |
| | 3 | % | 5,3% | 3,1% | 5,7% | 3,1% | 4,9% | 8,2% | 23,1% | 12,2% | 5,1% | 3,4% | 5,2% | 5,3% |
| | **FOUNDATION** | **%** | **2,6%** | **0,0%** | **3,1%** | **0,4%** | **2,5%** | **5,7%** | **11,5%** | **6,1%** | **1,6%** | **2,3%** | **3,6%** | **1,0%** |
| | 2 | % | 2,3% | 0,0% | 2,8% | 0,4% | 2,2% | 5,3% | 7,7% | 5,0% | 1,4% | 2,2% | 3,4% | 0,6% |
| | 1 | % | 0,3% | 0,0% | 0,4% | 0,0% | 0,3% | 0,4% | 3,8% | 1,1% | 0,2% | 0,2% | 0,2% | 0,4% |

Tab. 4 - Dimension 1- Competence 1.3

The next chart (Tab. 5) represents the entire Dimension 1 with the three related competences:

| | | | total | gender | | age | | | | school types | | | In-service teacher | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | total sample | Male | Female | 23-35 | 36-45 | 46-55 | Over 55 | Primary | Lower Secondary | Upper Secondary | Yes | No |
| AREA 1 - INFORMATION AND DATA LITERACY (mean values) | N | | 1.313 | 226 | 1.087 | 452 | 590 | 245 | 26 | 181 | 489 | 643 | 804 | 509 |
| | mean | | 5,71 | 6,09 | 5,63 | 6,05 | 5,68 | 5,29 | 4,35 | 5,14 | 5,87 | 5,74 | 5,71 | 5,71 |
| | median | | 6 | 6 | 6 | 6 | 6 | 6 | 4 | 5 | 6 | 6 | 6 | 6 |
| | mode | | 6 | 6 | 6 | 6 | 6 | 6 | 3 | 6 | 6 | 6 | 6 | 6 |
| | std. Deviation | | 1,45 | 1,27 | 1,47 | 1,25 | 1,45 | 1,57 | 1,68 | 1,66 | 1,40 | 1,39 | 1,50 | 1,36 |
| | std. e. m. | | 0,04 | 0,08 | 0,04 | 0,06 | 0,06 | 0,10 | 0,33 | 0,12 | 0,06 | 0,05 | 0,05 | 0,06 |
| | max | | 8 | 8 | 8 | 8 | 8 | 8 | 7 | 8 | 8 | 8 | 8 | 8 |
| | min | | 1 | 3 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 |
| | range (max-min) | | 7 | 5 | 7 | 6 | 7 | 7 | 6 | 7 | 7 | 6 | 7 | 7 |
| AREA 1 - INFORMATION AND DATA LITERACY (frequencies) | **SPECIALISED** | **%** | **31,3%** | **40,1%** | **29,4%** | **37,9%** | **30,6%** | **22,2%** | **16,7%** | **24,3%** | **34,9%** | **30,4%** | **32,6%** | **29,1%** |
| | 8 | % | 11,7% | 15,6% | 10,8% | 13,6% | 11,4% | 9,8% | 1,3% | 8,1% | 13,1% | 11,6% | 12,2% | 10,8% |
| | 7 | % | 19,6% | 24,5% | 18,6% | 24,3% | 19,2% | 12,4% | 15,4% | 16,2% | 21,8% | 18,9% | 20,4% | 18,3% |
| | **ADVANCED** | **%** | **46,0%** | **45,3%** | **46,1%** | **48,4%** | **45,8%** | **44,5%** | **21,8%** | **36,6%** | **46,6%** | **48,1%** | **43,7%** | **49,5%** |
| | 6 | % | 31,0% | 31,4% | 30,9% | 33,9% | 30,5% | 28,4% | 16,7% | 23,2% | 32,2% | 32,3% | 30,6% | 31,6% |
| | 5 | % | 15,0% | 13,9% | 15,2% | 14,5% | 15,3% | 16,1% | 5,1% | 13,4% | 14,5% | 15,8% | 13,1% | 17,9% |
| | **INTERMEDIATE** | **%** | **20,1%** | **14,5%** | **21,3%** | **13,0%** | **21,0%** | **28,2%** | **48,7%** | **32,8%** | **16,7%** | **19,2%** | **20,2%** | **20,0%** |
| | 4 | % | 14,4% | 11,4% | 15,1% | 10,0% | 15,6% | 18,9% | 23,1% | 19,9% | 11,7% | 15,0% | 14,4% | 14,5% |
| | 3 | % | 5,7% | 3,1% | 6,3% | 3,0% | 5,4% | 9,3% | 25,6% | 12,9% | 5,0% | 4,2% | 5,8% | 5,5% |
| | **FOUNDATION** | **%** | **2,6%** | **0,1%** | **3,2%** | **0,7%** | **2,6%** | **5,2%** | **12,8%** | **6,3%** | **1,8%** | **2,3%** | **3,4%** | **1,4%** |
| | 2 | % | 2,2% | 0,1% | 2,6% | 0,7% | 2,1% | 4,5% | 9,0% | 5,2% | 1,2% | 2,1% | 3,0% | 0,9% |
| | 1 | % | 0,4% | 0,0% | 0,5% | 0,0% | 0,5% | 0,7% | 3,8% | 1,1% | 0,5% | 0,2% | 0,4% | 0,5% |
| | Total | Answers | 3.939 | 678 | 3.261 | 1.356 | 1.770 | 735 | 78 | 543 | 1.467 | 1.929 | 2.412 | 1.527 |

Tab. 5 - Area 1 – Global

Analysing the data, the competence level with the highest percentage is advanced: 46% with equal results between genders; the specialised level registered 31.2%, with a marked difference between 40.1% for males and 29.4% for females. The intermediate level achieves a 20%, which in any case represents one-fifth of the total sample and demonstrates a competence that should certainly be strengthened; the foundation level is relatively low: in fact, it registered 2.9%, with exclusively female samples. For both the intermediate and the foundation level, the most representative sample is positioned on the higher age range (over 55), which shows that the lower the competence, the higher the age.

Area 2 investigates the skills necessary to be able to communicate and collaborate through the media and the network. These skills become necessary to obtain effective media communication in relation to the contexts, educational needs and potential of the pupils.

The data analysis of competence 2.1 “Interacting Through Digital Technologies” (Tab. 6) shows us how 47.5% of the sample has an advanced level. However, the remaining 52.5 has a varied distribution: 26.7% is positioned on a specialised level, while 25.7% is included the intermediate and foundation lower levels. Furthermore, the percentages referring to the highest levels fall within the lower age range and, on the other hand, 57.7% of the intermediate level are constituted by the over 55s. In relation to the type of school, the lower and upper secondary register the highest percentages in the Advanced and Specialised levels, while within the lower competence levels primary school teachers represent the most representative sample.

| | | | total | gender | | age | | | | school types | | | In-service teacher | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | total sample | Male | Female | 23-35 | 36-45 | 46-55 | Over 55 | Primary | Lower Secondary | Upper Secondary | Yes | No |
| 2.1 INTERACTING THROUGH DIGITAL TECHNOLOGIES | Statistics | N | 1.313 | 226 | 1.087 | 452 | 590 | 245 | 26 | 181 | 489 | 643 | 804 | 509 |
| | | mean | 5,50 | 5,82 | 5,44 | 5,88 | 5,49 | 4,99 | 4,08 | 5,17 | 5,62 | 5,51 | 5,56 | 5,41 |
| | | median | 6 | 6 | 6 | 6 | 6 | 5 | 4 | 5 | 6 | 6 | 6 | 5 |
| | | mode | 6 | 6 | 6 | 6 | 6 | 6 | 3 | 6 | 6 | 6 | 6 | 6 |
| | | std. Deviation | 1,50 | 1,42 | 1,51 | 1,31 | 1,48 | 1,60 | 1,74 | 1,68 | 1,49 | 1,44 | 1,55 | 1,42 |
| | | std. e. m. | 0,04 | 0,09 | 0,05 | 0,06 | 0,06 | 0,10 | 0,34 | 0,12 | 0,07 | 0,06 | 0,05 | 0,06 |
| | | max | 8 | 8 | 8 | 8 | 8 | 8 | 7 | 8 | 8 | 8 | 8 | 8 |
| | | min | 1 | 3 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | range (max-min) | 7 | 5 | 7 | 6 | 7 | 7 | 6 | 7 | 7 | 7 | 7 | 7 |
| | **SPECIALISED** | **%** | **26,7%** | **33,2%** | **25,4%** | **34,1%** | **26,4%** | **15,1%** | **15,4%** | **23,2%** | **28,8%** | **26,1%** | **29,1%** | **23,0%** |
| | 8 | % | 8,1% | 13,7% | 7,0% | 10,2% | 7,8% | 6,1% | 0,0% | 7,2% | 8,8% | 7,9% | 9,0% | 6,9% |
| | 7 | % | 18,6% | 19,5% | 18,4% | 23,9% | 18,6% | 9,0% | 15,4% | 16,0% | 20,0% | 18,2% | 20,1% | 16,1% |
| | **ADVANCED** | **%** | **47,5%** | **46,0%** | **47,8%** | **51,1%** | **46,8%** | **46,1%** | **15,4%** | **41,4%** | **48,1%** | **48,8%** | **45,9%** | **50,1%** |
| | 6 | % | 28,0% | 28,8% | 27,8% | 30,1% | 27,6% | 26,9% | 7,7% | 24,3% | 31,3% | 26,4% | 29,1% | 26,1% |
| | 5 | % | 19,6% | 17,3% | 20,1% | 21,0% | 19,2% | 19,2% | 7,7% | 17,1% | 16,8% | 22,4% | 16,8% | 24,0% |
| | **INTERMEDIATE** | **%** | **22,6%** | **20,8%** | **23,0%** | **13,9%** | **24,1%** | **31,4%** | **57,7%** | **29,3%** | **20,2%** | **22,6%** | **21,1%** | **25,0%** |
| | 4 | % | 16,0% | 15,0% | 16,2% | 10,6% | 16,9% | 22,4% | 26,9% | 17,7% | 14,1% | 17,0% | 14,3% | 18,7% |
| | 3 | % | 6,6% | 5,8% | 6,8% | 3,3% | 7,1% | 9,0% | 30,8% | 11,6% | 6,1% | 5,6% | 6,8% | 6,3% |
| | **FOUNDATION** | **%** | **3,1%** | **0,0%** | **3,8%** | **0,9%** | **2,7%** | **7,3%** | **11,5%** | **6,1%** | **2,9%** | **2,5%** | **3,9%** | **2,0%** |
| | 2 | % | 2,6% | 0,0% | 3,1% | 0,9% | 2,5% | 5,7% | 3,8% | 4,4% | 2,2% | 2,3% | 3,4% | 1,4% |
| | 1 | % | 0,5% | 0,0% | 0,6% | 0,0% | 0,2% | 1,6% | 7,7% | 1,7% | 0,6% | 0,2% | 0,5% | 0,6% |

Tab. 6 – Competence 2.1

As for competence 2.2 “Sharing Through Digital Technologies” (Tab. 7) the levels remain almost identical to those of the previous competence. It should be noted that the advanced level is exactly the same (45.1%) between male and female teachers, while the specialised level is slightly lower to the one registered for competence 2.1. In addition, 37.5% of teachers aged between 46/55 and 61.5% of teachers over 55 are at competence levels between intermediate and foundation.

| | | | total | gender | | age | | | | school types | | | In-service teacher | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | total sample | Male | Female | 23-35 | 36-45 | 46-55 | Over 55 | Primary | Lower Secondary | Upper Secondary | Yes | No |
| 2.2 SHARING THROUGH DIGITAL TECHNOLOGIES | Statistics | N | 1.313 | 226 | 1.087 | 452 | 590 | 245 | 26 | 181 | 489 | 643 | 804 | 509 |
| | | mean | 5,56 | 5,92 | 5,49 | 5,98 | 5,51 | 5,05 | 4,38 | 5,24 | 5,70 | 5,55 | 5,61 | 5,49 |
| | | median | 6 | 6 | 6 | 6 | 6 | 5 | 4 | 5 | 6 | 6 | 6 | 6 |
| | | mode | 6 | 6 | 6 | 6 | 6 | 6 | 3 | 6 | 6 | 6 | 6 | 6 |
| | | std. Deviation | 1,52 | 1,41 | 1,53 | 1,36 | 1,50 | 1,58 | 1,72 | 1,64 | 1,50 | 1,48 | 1,56 | 1,45 |
| | | std. e. m. | 0,04 | 0,09 | 0,05 | 0,06 | 0,06 | 0,10 | 0,34 | 0,12 | 0,07 | 0,06 | 0,06 | 0,06 |
| | | max | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| | | min | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | range (max-min) | 7 | 6 | 7 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| | **SPECIALISED** | **%** | **28,6%** | **35,8%** | **27,0%** | **38,7%** | **26,6%** | **15,9%** | **15,4%** | **24,3%** | **32,7%** | **26,6%** | **31,0%** | **24,8%** |
| | 8 | % | 9,5% | 14,2% | 8,6% | 12,8% | 8,8% | 5,7% | 3,8% | 9,4% | 10,0% | 9,2% | 10,4% | 8,1% |
| | 7 | % | 19,0% | 21,7% | 18,5% | 25,9% | 17,8% | 10,2% | 11,5% | 14,9% | 22,7% | 17,4% | 20,5% | 16,7% |
| | **ADVANCED** | **%** | **45,1%** | **45,1%** | **45,1%** | **44,9%** | **45,6%** | **46,5%** | **23,1%** | **39,2%** | **44,4%** | **47,3%** | **43,0%** | **48,3%** |
| | 6 | % | 28,6% | 31,0% | 28,1% | 29,2% | 28,5% | 29,4% | 11,5% | 22,1% | 29,2% | 29,9% | 28,4% | 28,9% |
| | 5 | % | 16,5% | 14,2% | 17,0% | 15,7% | 17,1% | 17,1% | 11,5% | 17,1% | 15,1% | 17,4% | 14,7% | 19,4% |
| | **INTERMEDIATE** | **%** | **23,6%** | **18,6%** | **24,7%** | **15,7%** | **25,1%** | **31,4%** | **53,8%** | **33,1%** | **20,7%** | **23,2%** | **22,9%** | **24,8%** |
| | 4 | % | 17,0% | 13,7% | 17,7% | 11,9% | 19,0% | 20,4% | 26,9% | 21,0% | 13,7% | 18,4% | 15,8% | 18,9% |
| | 3 | % | 6,6% | 4,9% | 7,0% | 3,8% | 6,1% | 11,0% | 26,9% | 12,2% | 7,0% | 4,8% | 7,1% | 5,9% |
| | **FOUNDATION** | **%** | **2,7%** | **0,4%** | **3,2%** | **0,7%** | **2,7%** | **6,1%** | **7,7%** | **3,3%** | **2,2%** | **3,0%** | **3,1%** | **2,2%** |
| | 2 | % | 2,2% | 0,4% | 2,6% | 0,7% | 2,2% | 4,9% | 3,8% | 2,2% | 1,8% | 2,5% | 2,5% | 1,8% |
| | 1 | % | 0,5% | 0,0% | 0,6% | 0,0% | 0,5% | 1,2% | 3,8% | 1,1% | 0,4% | 0,5% | 0,6% | 0,4% |

Tab.7 - Competence 2.2

Competence 2.3 refers to “Engaging Citizenship Through Digital Technologies” - To participate in society through the use of public and private digital services, while the subsequent 2.4 “Collaborating Through Digital Technologies” (Tab. 8) is a fundamental competence. It refers to the ability to use digital tools and technologies for collaborative processes, and for co-construction and co-creation of data, resources and knowledge. Data analysis highlights that 26.4% have an advanced level, therefore one fourth of the sample collaborates through digital technologies in an excellent way, masters the media productively, manages to create learning objects and produce knowledge.
However almost 50% of the sample has an advanced competence level; the remaining 25% has a level between intermediate and foundation, one in four teachers does not have sufficient ability to autonomously organise and re-elaborate contents and digital learning materials. Also in this competence, age groups between 46/55 and over55 register lower competence levels, respectively 43.8% and 53.8% of the relevant sample (NET intermediate and foundation).

| | | | total | gender | | age | | | | school types | | | In-service teacher | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | total sample | Male | Female | 23-35 | 36-45 | 46-55 | Over 55 | Primary | Lower Secondary | Upper Secondary | Yes | No |
| 2.4 COLLABORATING THROUGH DIGITAL TECHNOLOGIES | Statistics | N | 1.313 | 226 | 1.087 | 452 | 590 | 245 | 26 | 181 | 489 | 643 | 804 | 509 |
| | | mean | 5,49 | 5,75 | 5,44 | 5,82 | 5,46 | 5,06 | 4,58 | 5,31 | 5,61 | 5,45 | 5,55 | 5,40 |
| | | median | 6 | 6 | 6 | 6 | 6 | 5 | 4 | 5 | 6 | 6 | 6 | 6 |
| | | mode | 6 | 6 | 6 | 6 | 6 | 6 | 4 | 6 | 6 | 6 | 6 | 6 |
| | | std. Deviation | 1,51 | 1,42 | 1,53 | 1,39 | 1,49 | 1,62 | 1,81 | 1,63 | 1,51 | 1,48 | 1,52 | 1,50 |
| | | std. e. m. | 0,04 | 0,09 | 0,05 | 0,07 | 0,06 | 0,10 | 0,36 | 0,12 | 0,07 | 0,06 | 0,05 | 0,07 |
| | | max | 8 | 8 | 8 | 8 | 8 | 8 | 7 | 8 | 8 | 8 | 8 | 8 |
| | | min | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | range (max-min) | 7 | 7 | 7 | 6 | 7 | 7 | 6 | 7 | 7 | 7 | 7 | 7 |
| | **SPECIALISED** | **%** | **26,4%** | **30,5%** | **25,5%** | **33,8%** | **25,3%** | **15,5%** | **23,1%** | **23,2%** | **30,1%** | **24,4%** | **28,1%** | **23,6%** |
| | 8 | % | 9,1% | 11,9% | 8,6% | 10,8% | 8,8% | 7,8% | 0,0% | 11,0% | 9,6% | 8,2% | 9,8% | 8,1% |
| | 7 | % | 17,2% | 18,6% | 16,9% | 23,0% | 16,4% | 7,8% | 23,1% | 12,2% | 20,4% | 16,2% | 18,3% | 15,5% |
| | **ADVANCED** | **%** | **46,7%** | **47,3%** | **46,6%** | **46,9%** | **47,5%** | **46,9%** | **23,1%** | **45,3%** | **45,2%** | **48,2%** | **46,4%** | **47,2%** |
| | 6 | % | 27,1% | 29,6% | 26,6% | 28,3% | 26,1% | 29,0% | 11,5% | 24,9% | 27,4% | 27,5% | 27,1% | 27,1% |
| | 5 | % | 19,6% | 17,7% | 20,0% | 18,6% | 21,4% | 18,0% | 11,5% | 20,4% | 17,8% | 20,7% | 19,3% | 20,0% |
| | **INTERMEDIATE** | **%** | **23,7%** | **20,8%** | **24,3%** | **17,7%** | **24,6%** | **30,6%** | **42,3%** | **27,1%** | **21,9%** | **24,1%** | **22,1%** | **26,1%** |
| | 4 | % | 18,0% | 18,1% | 17,9% | 14,8% | 18,5% | 22,0% | 23,1% | 16,6% | 17,0% | 19,1% | 16,5% | 20,2% |
| | 3 | % | 5,7% | 2,7% | 6,3% | 2,9% | 6,1% | 8,6% | 19,2% | 10,5% | 4,9% | 5,0% | 5,6% | 5,9% |
| | **FOUNDATION** | **%** | **3,3%** | **1,3%** | **3,7%** | **1,5%** | **2,7%** | **6,9%** | **11,5%** | **4,4%** | **2,9%** | **3,3%** | **3,4%** | **3,1%** |
| | 2 | % | 2,6% | 0,9% | 2,9% | 1,5% | 2,2% | 4,9% | 7,7% | 3,9% | 2,0% | 2,6% | 2,9% | 2,2% |
| | 1 | % | 0,7% | 0,4% | 0,7% | 0,0% | 0,5% | 2,0% | 3,8% | 0,6% | 0,8% | 0,6% | 0,5% | 1,0% |

Tab. 8 - Competence 2.4

Area 3 “Digital Content Creation”, on the other hand, has a fundamental function for the teacher, as it refers to the teacher’s ability to create and edit digital content in different formats, to express oneself through digital means. In particular, the competence of developing digital content is significant to be

able to calibrate learning objects through the creation and development of digital content based on the student's needs. Mediality at the service of disability. In the following chart (Tab. 9), data referring to competence 3.1 "Developing Digital Content" are reported

| | | | total | gender | | age | | | | school types | | | In-service teacher | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | total sample | Male | Female | 23-35 | 36-45 | 46-55 | Over 55 | Primary | Lower Secondary | Upper Secondary | Yes | No |
| 3.1 DEVELOPING DIGITAL CONTENT | Statistics | N | 1.313 | 226 | 1.087 | 452 | 590 | 245 | 26 | 181 | 489 | 643 | 804 | 509 |
| | | mean | 5,40 | 5,68 | 5,34 | 5,75 | 5,41 | 4,86 | 4,23 | 5,17 | 5,51 | 5,39 | 5,43 | 5,36 |
| | | median | 6 | 6 | 6 | 6 | 6 | 5 | 4 | 5 | 6 | 6 | 6 | 6 |
| | | mode | 6 | 6 | 6 | 6 | 6 | 6 | 3 | 6 | 6 | 6 | 6 | 6 |
| | | std. Deviation | 1,55 | 1,41 | 1,57 | 1,37 | 1,54 | 1,65 | 1,73 | 1,62 | 1,56 | 1,51 | 1,58 | 1,49 |
| | | std. e. m. | 0,04 | 0,09 | 0,05 | 0,06 | 0,06 | 0,11 | 0,34 | 0,12 | 0,07 | 0,06 | 0,06 | 0,07 |
| | | max | 8 | 8 | 8 | 8 | 8 | 8 | 7 | 8 | 8 | 8 | 8 | 8 |
| | | min | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | range (max-min) | 7 | 6 | 7 | 6 | 7 | 7 | 6 | 7 | 7 | 7 | 7 | 7 |
| | **SPECIALISED** | **%** | **24,3%** | **27,0%** | **23,7%** | **30,1%** | **24,9%** | **13,5%** | **11,5%** | **20,4%** | **26,4%** | **23,8%** | **25,9%** | **21,8%** |
| | 8 | % | 8,1% | 12,4% | 7,3% | 8,8% | 9,0% | 5,7% | 0,0% | 7,7% | 10,0% | 6,8% | 9,3% | 6,3% |
| | 7 | % | 16,1% | 14,6% | 16,5% | 21,2% | 15,9% | 7,8% | 11,5% | 12,7% | 16,4% | 17,0% | 16,5% | 15,5% |
| | **ADVANCED** | **%** | **46,5%** | **50,4%** | **45,6%** | **50,9%** | **45,3%** | **42,9%** | **30,8%** | **43,6%** | **47,0%** | **46,8%** | **44,4%** | **49,7%** |
| | 6 | % | 28,6% | 31,0% | 28,1% | 31,9% | 26,8% | 28,2% | 15,4% | 26,0% | 29,7% | 28,5% | 28,0% | 29,5% |
| | 5 | % | 17,9% | 19,5% | 17,6% | 19,0% | 18,5% | 14,7% | 15,4% | 17,7% | 17,4% | 18,4% | 16,4% | 20,2% |
| | **INTERMEDIATE** | **%** | **25,2%** | **22,1%** | **25,9%** | **16,8%** | **26,4%** | **35,5%** | **46,2%** | **30,9%** | **22,9%** | **25,3%** | **25,5%** | **24,8%** |
| | 4 | % | 18,2% | 16,4% | 18,6% | 13,9% | 19,3% | 23,3% | 19,2% | 21,0% | 16,2% | 19,0% | 18,5% | 17,7% |
| | 3 | % | 7,0% | 5,8% | 7,3% | 2,9% | 7,1% | 12,2% | 26,9% | 9,9% | 6,7% | 6,4% | 7,0% | 7,1% |
| | **FOUNDATION** | **%** | **4,0%** | **0,4%** | **4,8%** | **2,2%** | **3,4%** | **8,2%** | **11,5%** | **5,0%** | **3,7%** | **4,0%** | **4,2%** | **3,7%** |
| | 2 | % | 3,2% | 0,4% | 3,8% | 2,2% | 2,9% | 5,7% | 3,8% | 3,3% | 2,7% | 3,6% | 3,4% | 2,9% |
| | 1 | % | 0,8% | 0,0% | 1,0% | 0,0% | 0,5% | 2,4% | 7,7% | 1,7% | 1,0% | 0,5% | 0,9% | 0,8% |

Tab. 9 - Competence 3.1

Data analysis points out a decrease in the specialised competence level, as compared to the other skills analysed so far. Moreover, the percentage rises in the intermediate and foundation levels, where it reaches almost 30%. Furthermore, the lowering of competence level in relation to the sample's growing age is even more significant: in fact, the foundation level competence grows from 2.2% in the 23/35 age group up to 11.5% in the over 55 age group age. Finally, it is evident that for both primary and upper secondary school the intermediate and basic competence levels reach percentage levels of respectively 36% and 30%.

The subsequent competence 3.2 "Integrating And Re-Elaborating Digital Content" (Tab. 10) refers to the teacher's ability to modify, refine and integrate new information and content into an existing body of knowledge and resources to create new, original and relevant content and knowledge.

| | | | total | gender | | age | | | | school types | | | In-service teacher | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | total sample | Male | Female | 23-35 | 36-45 | 46-55 | Over 55 | Primary | Lower Secondary | Upper Secondary | Yes | No |
| 3.2 INTEGRATING AND RE-ELABORATING DIGITAL CONTENT | Statistics | N | 1.313 | 226 | 1.087 | 452 | 590 | 245 | 26 | 181 | 489 | 643 | 804 | 509 |
| | | mean | 5,37 | 5,72 | 5,30 | 5,71 | 5,37 | 4,87 | 4,15 | 5,05 | 5,49 | 5,38 | 5,40 | 5,34 |
| | | median | 6 | 6 | 5 | 6 | 6 | 5 | 4 | 5 | 6 | 6 | 6 | 5 |
| | | mode | 6 | 6 | 6 | 6 | 6 | 4 | 4 | 6 | 6 | 6 | 6 | 6 |
| | | std. Deviation | 1,55 | 1,44 | 1,56 | 1,37 | 1,56 | 1,62 | 1,67 | 1,65 | 1,54 | 1,51 | 1,58 | 1,50 |
| | | std. e. m. | 0,04 | 0,10 | 0,05 | 0,06 | 0,06 | 0,10 | 0,33 | 0,12 | 0,07 | 0,06 | 0,06 | 0,07 |
| | | max | 8 | 8 | 8 | 8 | 8 | 8 | 7 | 8 | 8 | 8 | 8 | 8 |
| | | min | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | range (max-min) | 7 | 7 | 7 | 6 | 7 | 7 | 6 | 7 | 7 | 7 | 7 | 7 |
| | **SPECIALISED** | **%** | **24,4%** | **28,8%** | **23,5%** | **29,9%** | **24,6%** | **15,5%** | **7,7%** | **20,4%** | **27,0%** | **23,5%** | **25,2%** | **23,0%** |
| | 8 | % | 7,6% | 12,4% | 6,6% | 8,6% | 8,1% | 5,3% | 0,0% | 5,5% | 9,0% | 7,2% | 8,3% | 6,5% |
| | 7 | % | 16,8% | 16,4% | 16,8% | 21,2% | 16,4% | 10,2% | 7,7% | 14,9% | 18,0% | 16,3% | 16,9% | 16,5% |
| | **ADVANCED** | **%** | **46,8%** | **51,3%** | **45,8%** | **50,9%** | **46,3%** | **42,4%** | **26,9%** | **42,5%** | **46,6%** | **48,1%** | **46,1%** | **47,7%** |
| | 6 | % | 26,5% | 30,5% | 25,7% | 29,4% | 26,3% | 22,0% | 23,1% | 22,7% | 27,0% | 27,2% | 26,7% | 26,1% |
| | 5 | % | 20,3% | 20,8% | 20,1% | 21,5% | 20,0% | 20,4% | 3,8% | 19,9% | 19,6% | 20,8% | 19,4% | 21,6% |
| | **INTERMEDIATE** | **%** | **24,4%** | **19,0%** | **25,6%** | **17,5%** | **24,7%** | **33,9%** | **50,0%** | **29,3%** | **23,1%** | **24,1%** | **23,5%** | **25,9%** |
| | 4 | % | 17,4% | 12,4% | 18,4% | 13,7% | 17,3% | 23,3% | 26,9% | 19,3% | 15,5% | 18,2% | 17,0% | 17,9% |
| | 3 | % | 7,1% | 6,6% | 7,2% | 3,8% | 7,5% | 10,6% | 23,1% | 9,9% | 7,6% | 5,9% | 6,5% | 8,1% |
| | **FOUNDATION** | **%** | **4,4%** | **0,9%** | **5,2%** | **1,8%** | **4,4%** | **8,2%** | **15,4%** | **7,7%** | **3,3%** | **4,4%** | **5,1%** | **3,3%** |
| | 2 | % | 3,7% | 0,4% | 4,3% | 1,8% | 3,7% | 6,1% | 11,5% | 6,1% | 2,7% | 3,7% | 4,4% | 2,6% |
| | 1 | % | 0,8% | 0,4% | 0,8% | 0,0% | 0,7% | 2,0% | 3,8% | 1,7% | 0,6% | 0,6% | 0,7% | 0,8% |

Tab. 10 - Competence 3.2

46.8% of the sample shows advanced competence, however almost 30% is on an intermediate/ foundation level. It should be highlighted that within this competence level, 29.1% is in the 36/45 age group, 42.1% is in the 46/55 group, and lastly 65.4% belongs to the over 55s. This shows that only the 23/35 age group has an excellent proficiency in this competence. Finally, also for this competence primary school teachers appear to be the most deficient, followed by the upper secondary ones.
The remaining competences 3.3 "Copyright And Licences" and 3.4 "Programming", even if investigated, are not reported in this study sequence as not relevant for the results, not essential to

innovative teaching methods and practices and not strictly linked to the pupils' educational impact. As for Dimension 4 "Safety", a report is given on the data analysis relating to competence 4.1 "Protecting Devices" (Tab.11), referring to the teacher's ability to protect devices and digital content, and to understand risks and threats in digital environments. Furthermore, the teacher must know about safety and security measures and have a due regard to reliability and privacy.

| | | | total | gender | | age | | | | school types | | | In-service teacher | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | total sample | Male | Female | 23-35 | 36-45 | 46-55 | Over 55 | Primary | Lower Secondary | Upper Secondary | Yes | No |
| 4.1 PROTECTING DEVICES | Statistics | N | 1.313 | 226 | 1.087 | 452 | 590 | 245 | 26 | 181 | 489 | 643 | 804 | 509 |
| | | mean | 4,88 | 5,50 | 4,75 | 5,20 | 4,82 | 4,50 | 4,19 | 4,79 | 4,88 | 4,91 | 4,93 | 4,81 |
| | | median | 5 | 6 | 5 | 5 | 5 | 4 | 4 | 5 | 5 | 5 | 5 | 5 |
| | | mode | 6 | 6 | 4 | 6 | 4 | 4 | 3 | 4 | 6 | 4 | 6 | 6 |
| | | std. Deviation | 1,72 | 1,60 | 1,71 | 1,62 | 1,72 | 1,76 | 1,90 | 1,72 | 1,80 | 1,66 | 1,74 | 1,68 |
| | | std. e. m. | 0,05 | 0,11 | 0,05 | 0,08 | 0,07 | 0,11 | 0,37 | 0,13 | 0,08 | 0,07 | 0,06 | 0,07 |
| | | max | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| | | min | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | range (max-min) | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| | **SPECIALISED** | % | **18,7%** | **28,8%** | **16,7%** | **23,2%** | **17,5%** | **13,5%** | **19,2%** | **18,2%** | **20,0%** | **17,9%** | **19,9%** | **16,9%** |
| | 8 | % | 5,7% | 9,3% | 5,0% | 7,3% | 6,1% | 2,0% | 3,8% | 4,4% | 6,5% | 5,4% | 6,6% | 4,3% |
| | 7 | % | 13,0% | 19,5% | 11,7% | 15,9% | 11,4% | 11,4% | 15,4% | 13,8% | 13,5% | 12,4% | 13,3% | 12,6% |
| | **ADVANCED** | % | **39,5%** | **45,1%** | **38,3%** | **43,8%** | **38,5%** | **36,3%** | **15,4%** | **37,0%** | **38,0%** | **41,2%** | **38,8%** | **40,5%** |
| | 6 | % | 20,6% | 26,5% | 19,3% | 22,3% | 20,0% | 20,0% | 7,7% | 18,2% | 21,3% | 20,7% | 20,5% | 20,6% |
| | 5 | % | 18,9% | 18,6% | 19,0% | 21,5% | 18,5% | 16,3% | 7,7% | 18,8% | 16,8% | 20,5% | 18,3% | 19,8% |
| | **INTERMEDIATE** | % | **31,8%** | **21,2%** | **33,9%** | **27,2%** | **34,1%** | **32,7%** | **50,0%** | **33,7%** | **30,1%** | **32,5%** | **31,5%** | **32,2%** |
| | 4 | % | 20,3% | 13,7% | 21,7% | 16,4% | 22,0% | 23,7% | 19,2% | 23,2% | 18,8% | 20,7% | 20,4% | 20,2% |
| | 3 | % | 11,4% | 7,5% | 12,2% | 10,8% | 12,0% | 9,0% | 30,8% | 10,5% | 11,2% | 11,8% | 11,1% | 12,0% |
| | **FOUNDATION** | % | **10,1%** | **4,9%** | **11,1%** | **5,8%** | **10,0%** | **17,6%** | **15,4%** | **11,0%** | **11,9%** | **8,4%** | **9,8%** | **10,4%** |
| | 2 | % | 7,8% | 4,4% | 8,6% | 5,3% | 7,5% | 13,1% | 11,5% | 8,3% | 9,2% | 6,7% | 7,5% | 8,4% |
| | 1 | % | 2,2% | 0,4% | 2,6% | 0,4% | 2,5% | 4,5% | 3,8% | 2,8% | 2,7% | 1,7% | 2,4% | 2,0% |

Tab. 11 - Competence 4.1

Data analysis shows an evident lowering of competence levels. The specialised level is at 18.7%, of which only 5.7% at the highest level. The advanced level is at 39.5%, while the intermediate/ foundation NET is at 41.9%. It is an extremely high percentage if we think that 4 out of 10 teachers do not have the competence to protect the devices on which they work and propose educational paths to their students with special educational needs. Furthermore, from the age of 45 upwards, the percentage becomes much more consistent: it is between 50.5% and 65.5%, so more than 6 out of 10 teachers do not have adequate skills.

Also in this competence, primary school teachers are the most deficient, which indicates that the youngest students are more exposed and less protected. Knowledge, skills and attitudes, as described in DigComp 2.2 (from 166 to 179) referring to this competence, should be mastered by the teaching staff in a highly professional way, so as to be sure to protect our students from the dangers of the network or even more serious cyberbullying phenomena. They are even more fundamental when related to the data results of the subsequent competence, 4.3 "Protecting Health And Well-Being" (Tab. 12)

| | | | total | gender | | age | | | | school types | | | In-service teacher | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | total sample | Male | Female | 23-35 | 36-45 | 46-55 | Over 55 | Primary | Lower Secondary | Upper Secondary | Yes | No |
| 4.3 PROTECTING HEALTH AND WELL-BEING | Statistics | N | 1.313 | 226 | 1.087 | 452 | 590 | 245 | 26 | 181 | 489 | 643 | 804 | 509 |
| | | mean | 5,47 | 5,74 | 5,41 | 5,81 | 5,37 | 5,14 | 4,85 | 5,29 | 5,52 | 5,48 | 5,47 | 5,47 |
| | | median | 6 | 6 | 6 | 6 | 6 | 5 | 5 | 6 | 6 | 6 | 6 | 6 |
| | | mode | 6 | 6 | 6 | 6 | 6 | 6 | 5 | 6 | 6 | 6 | 6 | 6 |
| | | std. Deviation | 1,58 | 1,48 | 1,60 | 1,38 | 1,65 | 1,61 | 1,87 | 1,70 | 1,56 | 1,57 | 1,62 | 1,53 |
| | | std. e. m. | 0,04 | 0,10 | 0,05 | 0,07 | 0,07 | 0,10 | 0,37 | 0,13 | 0,07 | 0,06 | 0,06 | 0,07 |
| | | max | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| | | min | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | range (max-min) | 7 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| | **SPECIALISED** | % | **27,1%** | **30,1%** | **26,5%** | **32,7%** | **26,3%** | **19,2%** | **23,1%** | **25,4%** | **27,6%** | **27,2%** | **28,2%** | **25,3%** |
| | 8 | % | 9,8% | 12,8% | 9,2% | 10,6% | 10,5% | 6,9% | 7,7% | 7,7% | 10,0% | 10,3% | 10,3% | 9,0% |
| | 7 | % | 17,3% | 17,3% | 17,3% | 22,1% | 15,8% | 12,2% | 15,4% | 17,7% | 17,6% | 17,0% | 17,9% | 16,3% |
| | **ADVANCED** | % | **45,2%** | **50,0%** | **44,3%** | **50,2%** | **41,5%** | **46,1%** | **34,6%** | **43,6%** | **46,8%** | **44,5%** | **43,5%** | **47,9%** |
| | 6 | % | 26,6% | 31,9% | 25,5% | 29,4% | 24,9% | 26,9% | 11,5% | 25,4% | 27,6% | 26,1% | 25,2% | 28,7% |
| | 5 | % | 18,7% | 18,1% | 18,8% | 20,8% | 16,6% | 19,2% | 23,1% | 18,2% | 19,2% | 18,4% | 18,3% | 19,3% |
| | **INTERMEDIATE** | % | **23,5%** | **17,3%** | **24,7%** | **15,3%** | **27,3%** | **28,6%** | **30,8%** | **23,8%** | **21,9%** | **24,6%** | **23,5%** | **23,4%** |
| | 4 | % | 16,5% | 11,9% | 17,5% | 11,7% | 19,2% | 18,8% | 19,2% | 16,6% | 15,3% | 17,4% | 16,8% | 16,1% |
| | 3 | % | 6,9% | 5,3% | 7,3% | 3,5% | 8,1% | 9,8% | 11,5% | 7,2% | 6,5% | 7,2% | 6,7% | 7,3% |
| | **FOUNDATION** | % | **4,2%** | **2,7%** | **4,5%** | **1,8%** | **4,9%** | **6,1%** | **11,5%** | **7,2%** | **3,7%** | **3,7%** | **4,7%** | **3,3%** |
| | 2 | % | 3,3% | 2,7% | 3,4% | 1,5% | 3,7% | 4,9% | 7,7% | 4,4% | 2,7% | 3,4% | 3,6% | 2,8% |
| | 1 | % | 0,9% | 0,0% | 1,1% | 0,2% | 1,2% | 1,2% | 3,8% | 2,8% | 1,0% | 0,3% | 1,1% | 0,6% |

Tab. 12 - Competence 4.3

The analysis shows us how it is a deficient competence on the specialised and advanced levels, while the threshold indicated by the intermediate and foundation NET remains quite high, i.e., 37.6% of the global sample. In relation to gender, the percentage rises to 40.2% in the female gender, which - it must be remembered - represents 83% of the total sample. In over 55s the value rises to 61.6%.
Within the last DigComp Area, Area 5 called "Problem Solving", Competence 5.2 "Identifying Needs And Technological Responses" (Tab. 13) was analysed. It fully corresponds to the knowledge and attitudes that a special education teacher should possess. In fact, it reflects the ability to assess needs and to identify, evaluate, select and use digital tools and possible technological responses and to solve them; it also highlights the teacher's ability to adjust and customize digital environments to personal needs (e.g., Accessibility).

| | | | total | gender | | age | | | | school types | | | In-service teacher | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | total sample | Male | Female | 23-35 | 36-45 | 46-55 | Over 55 | Primary | Lower Secondary | Upper Secondary | Yes | No |
| 5.2 IDENTIFYING NEEDS AND TECHNOLOGICAL RESPONSES | Statistics | N | 1.313 | 226 | 1.087 | 452 | 590 | 245 | 26 | 181 | 489 | 643 | 804 | 509 |
| | | mean | 4,98 | 5,47 | 4,87 | 5,29 | 4,96 | 4,53 | 4,08 | 4,84 | 5,08 | 4,94 | 5,04 | 4,88 |
| | | median | 5 | 6 | 5 | 5 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 5 |
| | | mode | 6 | 6 | 6 | 6 | 6 | 4 | 3 | 4 | 6 | 6 | 6 | 4 |
| | | std. Deviation | 1,59 | 1,50 | 1,59 | 1,47 | 1,58 | 1,69 | 1,72 | 1,66 | 1,60 | 1,57 | 1,62 | 1,56 |
| | | std. e. m. | 0,04 | 0,10 | 0,05 | 0,07 | 0,07 | 0,11 | 0,34 | 0,12 | 0,07 | 0,06 | 0,06 | 0,07 |
| | | max | 8 | 8 | 8 | 8 | 8 | 8 | 7 | 8 | 8 | 8 | 8 | 8 |
| | | min | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | range (max-min) | 7 | 7 | 7 | 7 | 7 | 7 | 6 | 7 | 7 | 7 | 7 | 7 |
| | **SPECIALISED** | **%** | **17,1%** | **24,8%** | **15,5%** | **20,6%** | **16,4%** | **12,7%** | **15,4%** | **19,3%** | **18,4%** | **15,6%** | **18,7%** | **14,7%** |
| | 8 | % | 4,3% | 8,8% | 3,4% | 5,8% | 4,4% | 2,0% | 0,0% | 3,3% | 4,9% | 4,2% | 5,1% | 3,1% |
| | 7 | % | 12,8% | 15,9% | 12,1% | 14,8% | 12,0% | 10,6% | 15,4% | 16,0% | 13,5% | 11,4% | 13,6% | 11,6% |
| | **ADVANCED** | **%** | **44,5%** | **48,7%** | **43,6%** | **48,0%** | **45,8%** | **37,6%** | **19,2%** | **35,4%** | **45,6%** | **46,2%** | **45,4%** | **43,0%** |
| | 6 | % | 24,1% | 28,3% | 23,2% | 28,3% | 23,7% | 19,2% | 3,8% | 18,2% | 26,6% | 23,8% | 24,0% | 24,2% |
| | 5 | % | 20,4% | 20,4% | 20,4% | 19,7% | 22,0% | 18,4% | 15,4% | 17,1% | 19,0% | 22,4% | 21,4% | 18,9% |
| | **INTERMEDIATE** | **%** | **30,9%** | **23,0%** | **32,6%** | **27,7%** | **30,5%** | **35,5%** | **53,8%** | **38,1%** | **29,0%** | **30,3%** | **28,6%** | **34,6%** |
| | 4 | % | 20,9% | 17,3% | 21,6% | 20,8% | 19,3% | 24,5% | 23,1% | 24,3% | 20,2% | 20,4% | 18,4% | 24,8% |
| | 3 | % | 10,1% | 5,8% | 10,9% | 6,9% | 11,2% | 11,0% | 30,8% | 13,8% | 8,8% | 10,0% | 10,2% | 9,8% |
| | **FOUNDATION** | **%** | **7,5%** | **3,5%** | **8,3%** | **3,8%** | **7,3%** | **14,3%** | **11,5%** | **7,2%** | **7,0%** | **7,9%** | **7,3%** | **7,7%** |
| | 2 | % | 5,9% | 3,1% | 6,4% | 3,5% | 5,9% | 10,2% | 3,8% | 4,4% | 5,1% | 6,8% | 5,7% | 6,1% |
| | 1 | % | 1,6% | 0,4% | 1,8% | 0,2% | 1,4% | 4,1% | 7,7% | 2,8% | 1,8% | 1,1% | 1,6% | 1,6% |

Tab. 13 - Competence 5.2

Data show that the competence of intermediate and foundation levels represents 38.4% of the sample; almost 4 out of 10 teachers do not have a good ability to identify the pupils' needs and to provide adequate answers through technologies. It should also be noted that primary school teachers raise this percentage up to 45.3%. The knowledge and skills detailed within DigComp 2.2 illustrate these needs: e.g., knowing technical approaches that can improve the inclusiveness and accessibility of digital content and services, e.g., tools such as magnification or zoom and text-to-voice functionality. Additionally, this competence helps to be aware that AI-driven speech-based technology enables the use of spoken commands that can enhance the accessibility of digital tools and devices. Identifying needs and technological responses also means to know how to choose assistive tools to better access information and content online.
The subsequent competence 5.3 "Creatively Using Digital Technology" (Tab.14) refers to knowing how to use digital tools and technologies to create knowledge and to innovate processes and products. Possession of this competence highlights the ability to renew the teaching/learning process using digital technologies.

| | | | total | gender | | age | | | | school types | | | In-service teacher | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | total sample | Male | Female | 23-35 | 36-45 | 46-55 | Over 55 | Primary | Lower Secondary | Upper Secondary | Yes | No |
| 5.3 CREATIVELY USING DIGITAL TECHNOLOGYS | Statistics | N | 1.313 | 226 | 1.087 | 452 | 590 | 245 | 26 | 181 | 489 | 643 | 804 | 509 |
| | | mean | 5,34 | 5,62 | 5,28 | 5,66 | 5,31 | 4,90 | 4,42 | 5,15 | 5,45 | 5,30 | 5,35 | 5,31 |
| | | median | 5 | 6 | 5 | 6 | 5 | 5 | 5 | 5 | 6 | 5 | 6 | 5 |
| | | mode | 6 | 6 | 6 | 6 | 6 | 6 | 5 | 6 | 6 | 6 | 6 | 5 |
| | | std. Deviation | 1,57 | 1,52 | 1,57 | 1,42 | 1,59 | 1,62 | 1,58 | 1,59 | 1,58 | 1,54 | 1,60 | 1,52 |
| | | std. e. m. | 0,04 | 0,10 | 0,05 | 0,07 | 0,07 | 0,10 | 0,31 | 0,12 | 0,07 | 0,06 | 0,06 | 0,07 |
| | | max | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| | | min | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | range (max-min) | 7 | 7 | 7 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| | **SPECIALISED** | **%** | **24,2%** | **28,3%** | **23,4%** | **29,4%** | **24,4%** | **15,9%** | **7,7%** | **21,5%** | **26,8%** | **23,0%** | **24,6%** | **23,6%** |
| | 8 | % | 7,8% | 12,4% | 6,8% | 9,5% | 8,0% | 4,5% | 3,8% | 6,1% | 9,4% | 7,0% | 8,1% | 7,3% |
| | 7 | % | 16,5% | 15,9% | 16,6% | 19,9% | 16,4% | 11,4% | 3,8% | 15,5% | 17,4% | 16,0% | 16,5% | 16,3% |
| | **ADVANCED** | **%** | **45,1%** | **46,0%** | **44,9%** | **47,8%** | **43,7%** | **43,7%** | **42,3%** | **41,4%** | **44,8%** | **46,3%** | **44,8%** | **45,6%** |
| | 6 | % | 25,5% | 29,2% | 24,7% | 28,1% | 24,9% | 23,3% | 15,4% | 23,8% | 26,6% | 25,2% | 27,5% | 22,4% |
| | 5 | % | 19,6% | 16,8% | 20,1% | 19,7% | 18,8% | 20,4% | 26,9% | 17,7% | 18,2% | 21,2% | 17,3% | 23,2% |
| | **INTERMEDIATE** | **%** | **25,7%** | **23,0%** | **26,3%** | **20,6%** | **26,4%** | **31,8%** | **42,3%** | **32,0%** | **23,9%** | **25,3%** | **25,1%** | **26,7%** |
| | 4 | % | 18,9% | 18,1% | 19,0% | 17,3% | 19,0% | 21,6% | 19,2% | 22,1% | 17,0% | 19,4% | 18,0% | 20,2% |
| | 3 | % | 6,9% | 4,9% | 7,3% | 3,3% | 7,5% | 10,2% | 23,1% | 9,9% | 7,0% | 5,9% | 7,1% | 6,5% |
| | **FOUNDATION** | **%** | **5,0%** | **2,7%** | **5,4%** | **2,2%** | **5,4%** | **8,6%** | **7,7%** | **5,0%** | **4,5%** | **5,3%** | **5,5%** | **4,1%** |
| | 2 | % | 4,3% | 2,2% | 4,7% | 2,2% | 4,9% | 6,5% | 3,8% | 3,9% | 3,9% | 4,7% | 4,7% | 3,5% |
| | 1 | % | 0,7% | 0,4% | 0,7% | 0,0% | 0,5% | 2,0% | 3,8% | 1,1% | 0,6% | 0,6% | 0,7% | 0,6% |

Tab. 14 - Competence 5.3

The chart in Tab. 14 shows us the levels of competence: 30.7% of the sample is between the intermediate (25.7%) and foundation (5.0%) levels, therefore 3 out of 10 teachers do not have a suitable competence to develop creative and innovative didactic paths for their students through digital tools. This figure rises by one percentage point in absolute value if compared to the female sample only, but in relation to male teachers the gap is 6 percentage points. Moreover, in the over 55 age group, the value is 40.4%. For this competence too, the level difference of primary school teachers is evident: the intermediate/foundation NET is 37%, as opposed to 28.4 for lower secondary and 30.6 for upper secondary teachers.

Finally, a correlation was conducted between competence 2.1 "Interacting Through Digital Technologies", 5.2 "Identifying Needs And Technological Responses" (Tab.15/Fig.5) and 5.3 "Creatively Using Digital Technology" (Tab.16/Fig.6), with the aim to investigate whether the relationship between the various levels in the relevant competences had a linear or contrasting trend. The tables and related graphs below show the trends.

| | total sample | | Male | Female | | 23-35 | 36-45 | 46-55 | Over 55 | | Primary | L. Secondary | U. Secondary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Specialised/Advanced 2.1/5.. | 58,0% | | 67,7% | 55,9% | | 65,9% | 58,5% | 45,7% | 23,1% | | 51,9% | 60,5% | 57,7% |
| Intermediate/Foundation 2.1/5 | 22,1% | | 15,0% | 23,6% | | 12,2% | 23,1% | 34,3% | 57,7% | | 32,6% | 19,6% | 21,0% |
| "Misaligned" | 20,0% | | 17,3% | 20,5% | | 21,9% | 18,5% | 20,0% | 19,2% | | 15,5% | 19,8% | 21,3% |

Tab. 15 - Relationship 2.1/5.2

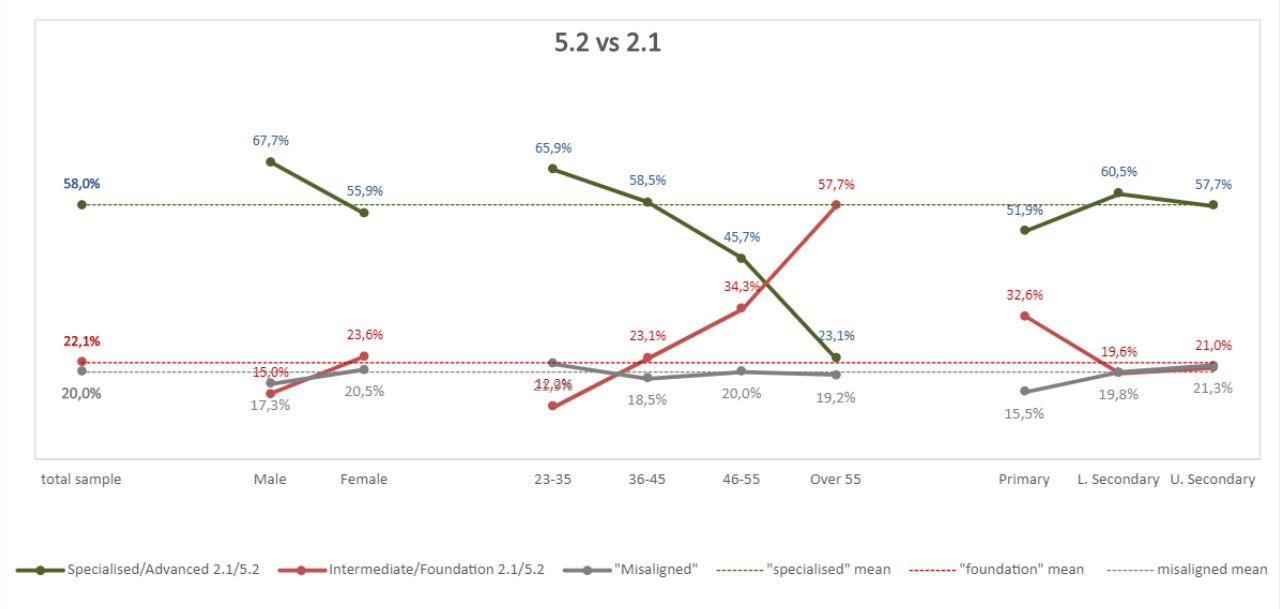

Fig. 5 - Correlation chart

| | total sample | | male | female | | 23-35 | 36-45 | 46-55 | Over 55 | | Primary | L. secondary | U. secondary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Specialised/advanced 5.3-2.1 | 63,8% | | 68,6% | 62,8% | | 73,5% | 62,5% | 53,1% | 26,9% | | 56,9% | 67,5% | 63,0% |
| Intermediate/foundation 5.3-2.1 | 20,3% | | 15,0% | 21,3% | | 11,1% | 21,2% | 32,2% | 46,2% | | 29,3% | 19,0% | 18,7% |
| "Misaligned" | 15,9% | | 16,4% | 15,8% | | 15,5% | 16,3% | 14,7% | 26,9% | | 13,8% | 13,5% | 18,4% |

Tab. 16 - Relationship 2.1/5.3

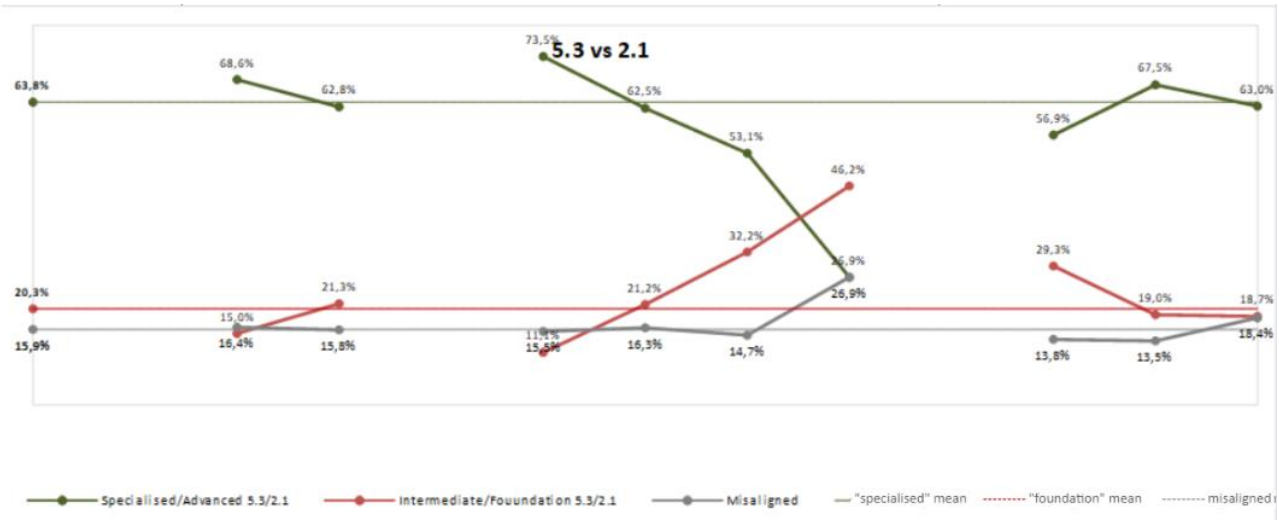


Fig. 6 - Correlation chart

### 3.4 Discussion

In general, literature argues that teachers tout court possess moderate levels of digital competence (Guillén & Mayorga, 2020; Montoro et al., 2015; Romero et al., 2019). These skills include the ability to solve problems using ICT, to work with a network of contacts and to use 2.0 tools for assessment. In the present study, albeit conducted through a self-assessment tool, the analyzed sample, i.e. special education teachers prepared to use digital technologies through the SEN specialisation path (TFA), stands at higher levels of competence. As shown in Figures 9, 10 and 17, the specialized level is in the range between 20 and 25%, while the advanced is between 35 and 40%. It would therefore seem evident that curricular teachers, by virtue of less training, are more deficient in digital skills. Furthermore, Blayone et al. (2017) highlight that also technical skills (creating and editing documents and managing online accounts, etc.), social skills (communicating via e-mail, sending and receiving messages and participating in social networks, etc.), and information literacy (finding and using articles, news and videos, etc.) are deficient. As analysed, competences 2.1 and 2.2 (Figs. 10 and 11) show how the level is not extremely low, indicating that only 25.7% is at the NET intermediate and foundation levels. Finally, it should be noted that the percentage in these levels increases considerably with the age of the sample and in primary school.

While the study by Romero Contreras and Pérez (2019) argues that the teachers' general level of digital competence does not exceed the medium-low level in relation to the understanding of the different media linguistic codes and the teachers' ability to interpret and evaluate the resources of representation and the analysis and evaluation of messages, this study shows that the sample that stands at intermediate and foundation levels in these skills represents only 25-30% of the sample,

demonstrating that the special education teachers' specialisation path allows an increase in levels with regard to digital skills. Furthermore, while the aforementioned authors highlight a gap in the ability to manage multimedia and multimodal communication tools, to adapt technological tools to the objectives and communication and teaching needs (skills 2.1 and 5.2), in this study only 25% of the sample is deficient.

Amhag et al. (2019) point out that teachers do not use digital tools for teaching purposes and need extensive pedagogical support to create quality digital teaching; however around 70% of the sample (specialised/advanced) state that they work using technology to create new digital content, so as to support an innovative teaching activity calibrated to the pupils' educational needs.

Similarly, some authors analyse the factors influencing the digital competence development of higher education teachers. The most explored variables are those relating to the individual characteristics of teachers. Thus, Guillén and Mayorga (2019) found differences based on gender, years of experience and professional experience and discovered that these variables negatively predicted the acquisition of Technological and Digital Competence (TDC). On the contrary, research and innovation projects have a positive impact. This data reflects the analysis of our research, where it is evident that, in almost all competences, the level of mastery decreases in female teachers; as a partial integration, the study shows that the level of primary school teachers is always lower than that of higher education teachers. Furthermore, the data relating to experience seems misaligned: in fact the years of seniority negatively affect the level of competence, and in the different dimensions represented through the Digcomp, the age between 25/36 almost always reaches the highest levels of competence.

For their part, Basantes et al. (2020) argue that the level of digital skills is independent of gender, but depends on age. Following this same line, Cabero et al. (2021) find that there are no significant differences between the teachers' gender and their digital skills. Therefore, results show that both teachers aged between 30 and 49 and those with an experience between 4 and 14 years show greater digital competence. In the proposed study, however, in all the different dimensions the sample represented by the older age was always the most deficient.

Therefore, this study highlights that special education teachers specialised through the TFA, develop a good mastery of digital skills; the sample, within the 5 dimensions developed by Digcomp, is always within the 60% / 75% range at a specialized or advanced level, while the remaining 40% / 25% has a competence between intermediate and foundation. In particular, the highest range is recorded in Area 3 "Digital content creation".

**Conclusions**

According to La Marca and Di Martino (2021, p. 154), the training needs most frequently reported by teachers highlight the development of digital skills as urgent, also in order to ensure adequate individualization and personalization in the planning of inclusive activities (Jerrim & Sims, 2019; Utgé et al., 2017). The quality of future teachers' training, and in particular of special education teachers, is considered one of the factors which has the greatest impact on the development of inclusive learning environments, attentive to the enhancement of differences (European Agency for the Development of Education for Disabled Students, 2012; Chiappetta Cajola, 2018; Ciraci & Isidori, 2017; Cottini, 2014; Damiani, 2015).

This study has highlighted a profound difference between the surveys on curricular teachers' digital skills discussed in literature compared to the sample of teachers prepared through the specialisation

path for special education activities. The data show how the registered levels are globally at medium and medium/high levels for three quarters of the sample.
In the current panorama, it becomes crucial for every teacher to frame the importance assumed by the so-called new technologies in the modification of their teaching action's communicative and strategic structure, even more so within the data analysis provided by the sample's self-assessment, provided it is aware and designed considering all its essential elements.
In fact, this survey shows the teachers' self-assessment, that is their self-perception of mastering knowledge and skills in a sufficiently organic way, so as to produce a positive impact on their teaching practices and therefore on the teaching/learning process.
However, the real management of digital in the classrooms is not aligned with the effectiveness of the proposed learning projects, especially in the creation of inclusive paths tailored to the pupils's special educational needs.
In recent years, the growing role of technologies in teaching has been the subject of scientific reflection in relation to the skills of teachers. The fact that the introduction of ICT in teaching - albeit accompanied by good technical knowledge - does not exclude knowing how to flexibly incorporate them into the contents of the discipline, in turn transposed with adequate methodological approaches to effectively enhance students' learning, means that the teachers' digital skills include a clear base of technological knowledge combined with a broad pedagogical competence and a deep knowledge of contents (Mishra & Koehler, 2006).
The special education teacher, *co-designer of learning* (Cottini, 2019), is doubly involved in this innovation process: on the one hand they must be able to grasp the potential offered by ICT in improving the quality of learning processes, on the other they must be able to prepare students with disabilities for a future in which these tools will increasingly play a fundamental role. Furthermore, the introduction of information and communication technologies in teaching affects both the profound, cognitive-planning structures of teachers (Ala-Mutka, 2011), engaging them in the conjugation of disciplinary knowledge, as well as the methodological and technological aspects, as highlighted in research on TPACK (Angeli & Valanides, 2005; Messina & De Rossi, 2015; Messina & Tabone, 2014; Mishra & Koehler, 2006). This triple function of the special education teacher represents at the same time the mediation between the knowledge level (Content Knowledge), the knowledge transmission level (Pedagogical Content Knowledge) and the use of the mediation tool in technological form, more specifically digital (Technological Pedagogical Content Knowledge).
Technologies therefore find a place in the specialisation course for special education, not only as an element of innovation, but as an opportunity for the improvement of training processes and in the expansion of the skills of teachers, who can better manage special education teaching from an inclusive perspective (Messina & De Rossi, 2015).
The proposed model (Fig.7) starts from the above mentioned triple functionality: the disciplinary knowledge, the knowledge of processes and the knowledge of the skillful use of technology.

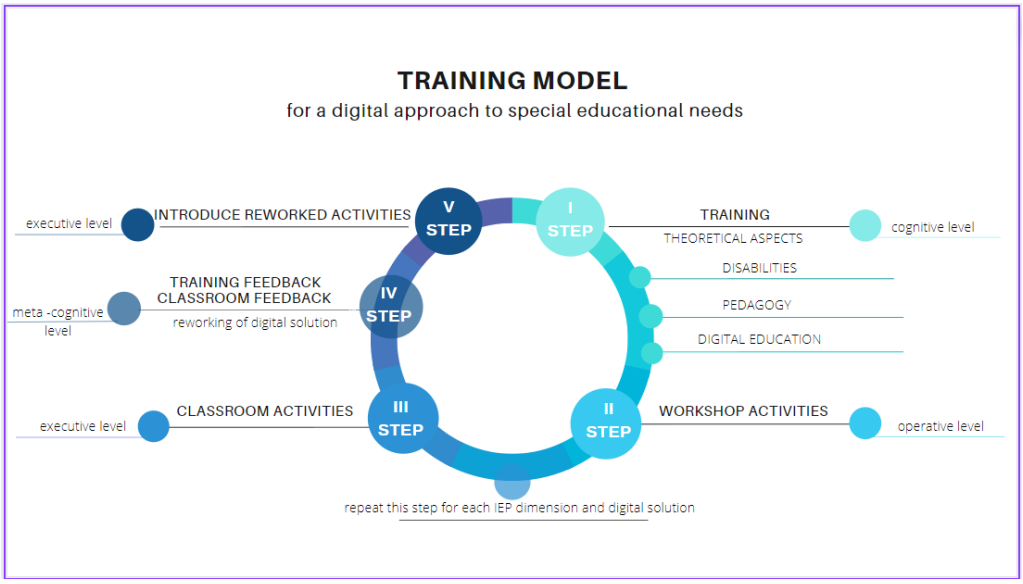


Fig. 7 – Training model

Furthermore, attention is directed to the ability of the special education teacher to operate in relation to the four dimensions present in the new IEP based on ICF and, within them, to be able to identify the most suitable strategy and digital tools to achieve the pupil's educational success through an inclusive lesson development. If on the one hand the teacher knows the strategies related to the different dimensions, on the other hand they should be able to choose, from time to time, the teaching practice to be adopted and the tools (software and hardware) to be used in order to stimulate the pupil's learning skills. In order to realise an effective model, it is useful to implement a permanent training for each dimension of the new IEP, so as to identify the most suitable strategic solutions in relation to disability. The theoretical part must therefore be accompanied by a guided laboratory development, in which the teacher can plan by experimenting. The third phase of the path involves the practical execution of the plan, inside the classroom. The fourth phase, on the other hand, represents the results self-assessment moment, monitored within a further training phase where educators can correct the critical issues and help the teachers develop new didactic paths.

The particularity is also represented by the periodicity and variety of topics discussed from time to time. This means that for each dimension of the IEP, in relation to each group of disabilities, a calibrated path is planned in a laboratory form, crossing all the possible didactic solutions realised through various technological tools.

In other words, considering dimension A - referring to the social relationship/interaction - as an example and following the study of each disability's theoretical constructs (*cognitive level*), it would be necessary to elaborate different didactic laboratories and implement them with the various possibilities offered by digital tools, for example to produce audio, video, digital maps, digital storytelling, gamification, ebooks, slides etc. (*operative level*). Each of these projects will have to be implemented in the field (*executive level*), and then return "in training" to correct and modify the critical points or weaknesses observed (*meta-cognitive level*). The fifth step is represented by the re-creation of the improved and appropriately calibrated activity with new digital solutions.

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