Teachers' perceptions of the role of technologies for inclusion.
Results from a special needs training course

Laura Fedeli
Università di Macerata

Abstract
The study focuses on the Information and Communication Technology course run within the "Special Needs Teacher Training Specialization Course" developed by the University of Macerata (Italy) in the academic year 2018-2019. Specifically, the case, framed in a qualitative approach, aims at analyzing how special needs trainee teachers (henceforth referred to as trainee teachers) approach the use of technology with inclusive perspectives and what factors can influence their decision-making process in using technology. The case highlights what connections can be drawn between the design and development of the Information and Communication Technology course and the trainee teachers' perceptions in direction of the UDL principles.

L'articolo presenta uno studio di caso basato sul corso di "Tecnologie dell'Informazione e della Comunicazione" avviato nell'anno accademico 2018-2019 nell'ambito del corso di specializzazione per il Sostegno presso l'Università degli studi di Macerata. Lo studio, di tipo qualitativo, analizza l'approccio che i corsisti mostrano nei confronti di una didattica inclusiva e le variabili che risultano associate ad un uso consapevole e intenzionale delle tecnologie. I dati raccolti evidenziano le relazioni tra la progettazione e lo sviluppo del corso e le percezioni dei partecipanti rispetto a una prospettiva legata ai principi dell'approccio UDL.

Keywords: teacher training; special needs; technologies; inclusion; UDL

Parole chiave: formazione docenti; specializzazione per il Sostegno; tecnologie; inclusione; UDL

DOI: https://doi.org/10.6092/issn.1970-2221/11585

1. Introduction

The concept of inclusion has widely been addressed in the policy and legislative developments as an umbrella term that was used with different connotations across countries and decades (Armstrong et al., 2010; D'Alonzo, 2018; Perla, 2013; Rice, 2019). In Italy the discussion around inclusion was underlined, since 2012, by the concept of "special training needs" and by promoting the idea that inclusive strategies do not uniquely involve students with disability, who are fully integrated in standard school activities in regular schools but embrace the whole classroom with students with different learning difficulties, and/or who experience a temporary disadvantageous situation due to socio-cultural, emotional and/or linguistic problems.

The idea of inclusion is based on «the recognition of full participation in the educational life of every single student (with and without disabilities); the appreciation of differences; and the change of contexts and the modification of the didactical answer that must shift from 'specialized to ordinary'» (Fedeli & Pennazio, 2019, p. 60-61). Inclusion implies the need of a synergic participation by all involved actors to a shared curricular planning at macro-school level and at micro-level of each discipline syllabus (Florian & Linklate, 2010; Kershner, 2007). In this scenario the school management can take advantage of a qualified professional profile, the «teacher for special needs», a teacher trained in the direction of «the acquisition of disciplinary, psycho-pedagogical, methodological-didactical, organizational and relational competences, necessary to enable students to achieve the learning outcomes» (MIUR, Decree 249/2010, article 2). Teachers specialized in dealing with disabilities are classroom teachers who are integral part of the class team and whose action is directed to the whole system, to students with disabilities and to all students in the classroom in a holistic perspective of learning design for all. This specific teacher training program received a deep organizational change in the academic year 2013/2014 with the Ministerial Decree 706 (MIUR, 2013) which activated new special needs specialization courses that are exclusively managed by universities and whose learning path (60 ECDS) includes frontal classes for different subject matter contents, internship, lab activities and a final dissertation. The case-study here described and object of analysis is related to the Information and Communication Technology course that covers 75 hours of instruction and is meant as a section of the internship module (300 hours) in the teacher training program (curriculum Primary School) in the academic year 2018-2019. The aim of the study, framed in a qualitative approach, is to analyze how trainee teachers approach the use of technology with inclusive perspectives and what factors can influence their decision-making process in using technology in class. The case will highlight what connections can be drawn between the design and development of the learning experience in the Information and Communication Technology course and the trainee teachers' perceptions in direction of the UDL principles.

2. Background: Universal Design for Learning and technology

Universal Design for Learning (UDL) is an educational framework inspired by the construct of Universal Design (UD), which has been used in different fields with the common rationale to satisfy all users by designing usable products and services without being forced to adapt them to the characteristics and/or the abilities of any single individual (Morra, & Reynolds, 2010).

DOI: https://doi.org/10.6092/issn.1970-2221/11585

UDL (Ghedin, & Mazzocut, 2017; Hall, Meyer, and Rose, 2012; Kurtts, 2006; Rose, & Strangman, 2007), one of the initiatives inspired by UD in the area of education, revisits the usability goal by embracing the principles of inclusion. The conceptual framework aims at satisfying all students' needs by designing teaching/learning processes where equal opportunities for each student can be reached by offering a flexible approach that can reduce learning barriers.

Researches focussed on UDL and developed at CAST (http://www.cast.org/) led to a three principles based framework and a set of practical tools useful to put them into practice in educational contexts. Educators/teachers and curriculum developers can benefit from CAST guidelines to apply the three UDL principles (engagement, representation, and action and expression) and modulate them according to different objectives connected to key abilities, namely "access", "build", "internalize", that can make each student proficient as expert learner, that is, "purposeful & motivated, resourceful & knowledgeable, strategic & goal-directed" (CAST, 2018).

Technology and digital and media literacy can play a relevant role in UDL, as underlined by Dalton "UDL principles and guidelines offer a unique way for educators in digital and media literacy fields to ensure that their work will benefit the widest range of learners, including those with learning challenges and disabilities" (2017, p.17). Moreover, the integration between UDL and technology enables schools to develop learning environments and processes fully accessible for all students (Friesem, 2017; Leach, 2017).

Rose and Meyer (2002) put an emphasis on the role of digital technology and variables like a multi-modal representation of content (connected to the characteristics of media to be versatile); those variables contribute to make the learning system able to meet diverse needs and to minimize the individual accommodation. Technology today can provide resources that can be easily marked/annotated, networked and modified, but the flexibility of technologies is not intrinsic and UDL is not merely about the use of technology in education, but it "is also about the pedagogy, or instructional practices, used for students with and without disabilities." (King-Sears, 2009, p.199).

A conscious learning design process and a suitable didactical approach are required to make digital tools and resources meaningfully integrated and usable in an inclusive perspective.

Teacher training in this direction should imply a focus on modelling UDL practices (Evmenova, 2018) where "it is important to make sure that teachers can bring together concepts related to instructional objectives, learner variability, UDL strategies, and technology affordances" (p.150).

If we analyse the three UDL principles with the lens of the affordances (Riva, 2010) of different technologies we can wonder what connections can be identified with inclusion and how those connections can affect students' wellness. Students' well-being implies a range of conditions (OECD, 2017) that need to be taken into consideration in the educational settings for the healthy development of students' motivation, which is also related to their power of action and learning and to the sense of belonging at school. According to the OECD study (2017) in Italy schools where students reported a major satisfaction for their life are characterized by a serene atmosphere in the classroom and the perception that each student is supported in his/her learning process, mostly in the scientific disciplines. But the data related to sense of belonging at school and psychological well-being when addressing, for example, students with an immigration background, show the disparities related to socio-economic or cultural/linguistic status and are larger than in other OECD countries.

DOI: https://doi.org/10.6092/issn.1970-2221/11585

If it is reasonable that inclusion is directly connected to students' quality of life the role of technology, in terms of technology –enhanced teaching activities towards an inclusive approach in the classroom, should address the different UDL levels to promote active learning:

- Engagement: focus on motivation and well-being;
- Representation: focus on content and means to display, organize and manage information;
- Action and expression: focus on communication and creativity to plan and create content.

Teacher training in the area of digital/media literacy can address two macro intertwined levels of awareness for the teaching/learning process: (1) the right of each learner to reach well-being at school; (2) the opportunity for each learner to reach that objective through a learning design which covers the UDL principles.

3. The case study: The special needs teacher training course

The object of the study is the "Special Needs Teacher Training Specialization Course" developed by the University of Macerata (Italy) and, specifically, the Information and Communication Technology course that covers 75 face-to-face hours of instruction.

The aim of the case-study is to analyse the following questions: How do trainee teachers approach the use of technology with inclusive perspectives? What factors, tied to the course approach, may have influenced their decision-making process in using technology in an inclusive way? An initial questionnaire and a final one with the addition of the professor's observations during class activity and a final group work presentation allow a reflection on the approach used in the course and the reached trainee teachers' awareness about potential affordances (direct and indirect) of technologies in terms of inclusion.

The course was designed starting from the results of the previous edition (Fedeli, & Pennazio, 2019) and by analysing its strengths and weaknesses. The hands-on format and the group work approach were maintained as showed to be the most effective aspects in order to facilitate the development of practical abilities and learning to learn skill.

The face-to-face course took advantage of the additional support of an online learning platform used to archive the study resources provided by the professor, guidelines about activities to be developed in presence and discussion areas to reflect on digital artifacts created by trainee teachers. Differently from the previous edition the course professor decided to move from a public wiki platform to an institutional learning management system (LMS Moodle administered by University). The decision was made for two main reasons: the wiki environment, in its free version, do not offer the features needed to store all resources and the trainee teachers' artifacts (the storage capability was low); the wiki has no suitable discussion tools while a learning management system like Moodle can integrate in a more effective way a blended learning path where communication, collaboration and file management meet the needs of activities to be developed in groups and /or individually.

Using an LMS was meant also as an experiential model for trainee teachers (Evmenova, 2018) in order to let them directly approach what working with different tools means (forum, wiki, etc.) and what are the implications of synchronous and asynchronous sessions. Being involved in group work in presence, but also being able to visualize other groups' activities in terms of final products and collaboration process through the platform was a strategy to enhance the learning experience in direction of the UDL principles (Hall, Meyer, & Rose, 2012). Specifically, technology in its different connotations (hardware, software) can be exploited to provide

DOI: https://doi.org/10.6092/issn.1970-2221/11585

multiple means of representation, action and expression and engagement and offer flexible ways to present what all actors involved (teacher, student and additional profiles) are doing (Table 1).

	Engagement	**Representation**	**Action and expression**
Access	How can technology be used to foster motivation and interest?	How content can be differently displayed thanks to digitalization?	How can different devices support the students' response?
Build	How social aspects connected to digital media can be used to improve collaboration and sense of belonging to the class group?	How multimodal way to display information can support the language comprehension and help decoding of disciplinary content?	How devices and media can impact on students' communication abilities and production of artifacts?
Internalize	How digital tools/environments can be used to develop reflection processes?	How digital tools/environments can support the development of strategies to organize and manage information?	How digital tools/environments can help plan and develop learning strategies?

Table 1: Technology and UDL principles

The course design on a content level provided inputs for practice and reflection on: (1) digital formats and editing/fruition tools (e.g., image; e-books readers like Freda); (2) digital visual organizers (e.g., digital concept/mental maps tools); (3) digital production (e.g., creating presentations, books, animations). On a methodological level all activities were described and developed in face-to-face classes in a computer lab with the additional use of a classroom that was used in turn by trainee teachers that needed more space for discussions and group work organization. The tasks implied both an individual effort in completing guided units of works to be able to acquire simple technical abilities and small group (4-5 members) activities where more complex tasks were completed in a collaborative approach (Robinson, 2017) where peer support is encouraged.
The approaches used (cooperative learning; reciprocal teaching and peer tutoring) are widely recognized in the literature as a support of UDL Principles (Downing, 2002; Jimenez, Graf, & Rose, 2007; Rose, & Meyer, 2002; Wood, Algozzine, & Avett, 1993).
The sequence of proposed activities and consistence with UDL is summarised in the following table (Table 2).

	Engagement	**Representation**	**Action and expression**
Activity 1 Small cooperative group work: discussion; creation of a presentation; peer assessment	Each group discusses and shares viewpoints and school experiences. Trainee teachers reflect on each	Each group's presentation can show different choices applied by trainee teachers (at graphical level) to	Each group creates a presentation using among a set of proposed formats (textual; multimedia; schematic, etc.)

DOI: https://doi.org/10.6092/issn.1970-2221/11585

	Engagement	Representation	Action and expression
	group presentation in a peer assessment process.	organize and display content and facilitate comprehension.	and devices (tablet, smartphone, computer).
Activity 2 Individual and collaborative group work: practice of images editing; creation of a poster with a specific objective for a lesson plan.	Each group examines authentic problem-based cases of school practices related to image and accessibility.	Each group's poster can show different choices applied by trainee teachers (at graphical level) to organize and display content to support the achievement of the objective.	Each group designs and creates the poster which is meant as one of the didactical mediator to use in the lesson plan. The group can choose among a set of proposed online services and devices (tablet, smartphone, computer) to create the poster.
Activity 3 Reciprocal teaching and cooperative group work: practice of mental/conceptual digital map; transcodification (from text to map); practicing maps to illustrate disciplinary content.	Each group organizes short teaching sessions for colleagues of other groups by using digital maps as primary mediator to present a specific disciplinary topic (science; history; language, etc.)	Trainee teachers experience different way of organize digital maps and include multimedia content (e.g. add images inside the nodes of the map).	Each group creates a set of sequential maps to illustrate a specific disciplinary topic and plan the way the different maps (from simpler to richer) can be used with different objectives.
Activity 4 Peer tutoring and cooperative group work: analysis of available online services and /or software to create e-books; creation of an e-book (optional paths available: recreation of a given story; imaginative creation of brand-new story).	Each trainee teacher can give his/her support in a dedicated online forum in order to help and/or give advices to any colleague during the creation of the e-book.	Each group chooses how to create the e-book: by using simple online services with pre-set graphical elements; by using online tools which allow a personalization of graphical elements; by using software that let the author upload multiple file formats and personalize the graphical layout.	Each group creates an e-book and try different devices to read it (e.g., e-readers) to test accessibility.
Activity 5 Individual and Cooperative group work: analysis of available online services and /or software to create animations; creation of a short animation with a specific objective.	Each trainee teacher practices with two different video animation systems to acquire basic skills.	Each group chooses the video animation system to use according to: available characters; graphical features; personalization, audio options.	Each group designs and creates a video animation of a social story-based narrative to help pupils understand proper behaviours at school.

DOI: https://doi.org/10.6092/issn.1970-2221/11585

	Engagement	Representation	Action and expression
Final group project Group work: design and present to the whole class a lesson plan in which instructional objectives, learner variability, strategies, and technology affordances are integrated.	During the collective presentation, given an assessment grid with set criteria, each trainee teacher peer assesses the work presented by each group.	Each group lesson plan can show different instructional design choices to meet the objectives and be meaningfully used with an inclusive approach. Those decisions are represented by content selection (in terms of format and organization) and content communication (visual/graphical choices).	Each group shows the lesson plan to the whole class by using a presentation tool. Each group member plays the role of presenter and highlights the instructional objectives, the resources used and the role of technology.

Table 2: Course activities and approaches consistent with UDL principles

The impact of group work and the peer discussion/tutoring was enhanced by the opportunity to develop part of the activities online through a dedicated discussion forum and the chance to archive the activities' outcomes in a way each group work was visible to all and could receive comments and suggestions by any interested trainee teacher.

4. Research and data analysis

The study here described takes a case- study qualitative approach (Baxter, & Jack, 2008; Yin, 2003, 2014) starting from the results collected by a previous case run in A.Y. 2016-2017 in the same context (Fedeli, & Pennazio 2019) where the investigation highlighted the trainee teachers' awareness about the complexity of the classroom which, according to them, requires flexibility and variation «in the modalities of facing situations, as well as disciplinary content and its formats» (p. 75).

The collected inputs from a previous case enabled the researcher go deeper in the exploration of trainee teachers' perceptions and focus on variation as a key concept to explore at the light of UDL and technology role.

The whole group of 100 trainee teachers represented the sample of participants and data sources included: (1) the open answers to an entry questionnaire submitted during the first class, (2) a final questionnaire submitted after the completion of the course (3) the presentation of a multimedia artifact created as a conclusive step by the different groups.

Content analysis applied to questionnaires' data (Bardin, 1977) and coded with the support of the quantitative/qualitative tools of analysis provided by the NVIVO (version 11 plus) software was integrated and triangulated with the course professor (who is the researcher in the present study) observations during class interactions and the participant-observations during the final presentation of the multimedia product.

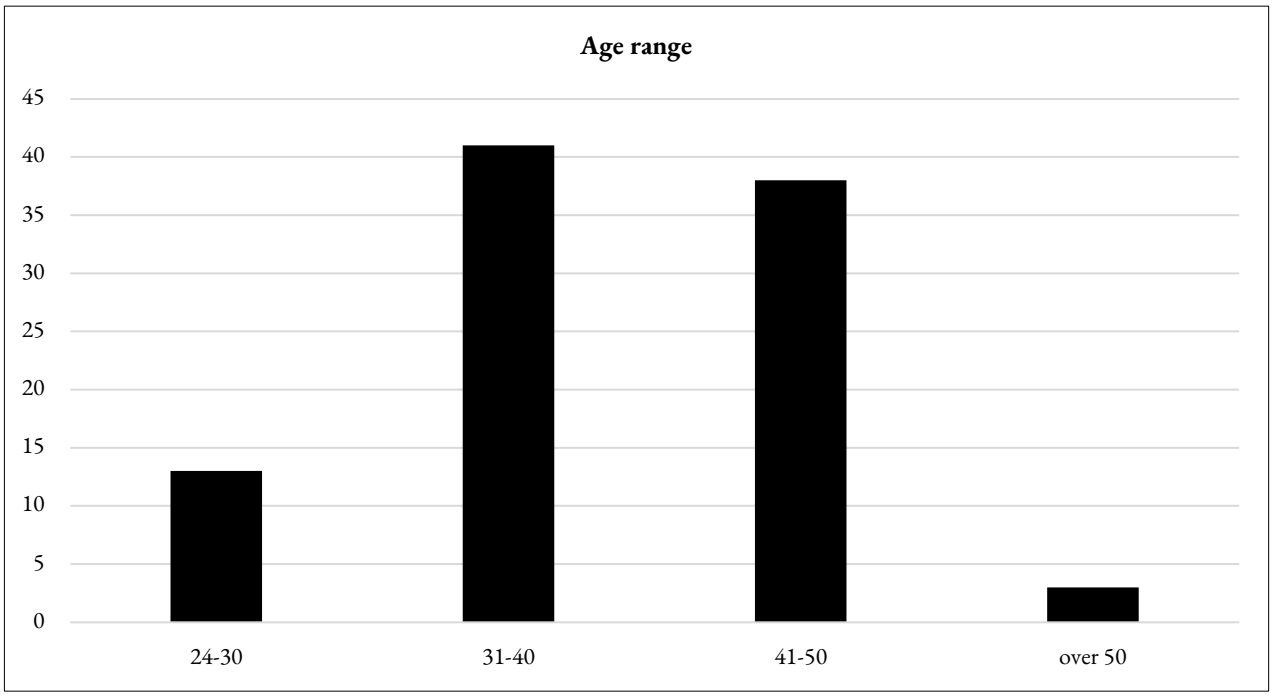
Both the initial and final questionnaire were aimed at collecting inputs about learners perceptions on inclusion, didactical strategies and the role of technology. Trainee teachers' initial perceptions and opinions will be mostly discussed to check if there occurred changes in the trainee teachers' attitudes after the course experience and how those changes occurred (how the course content, approach and overall course experience affected and

DOI: https://doi.org/10.6092/issn.1970-2221/11585

raised awareness about the role of technology for inclusion and UDL). The initial questionnaire, that was completed and submitted by 95 course participants, was structured around 2 sections:

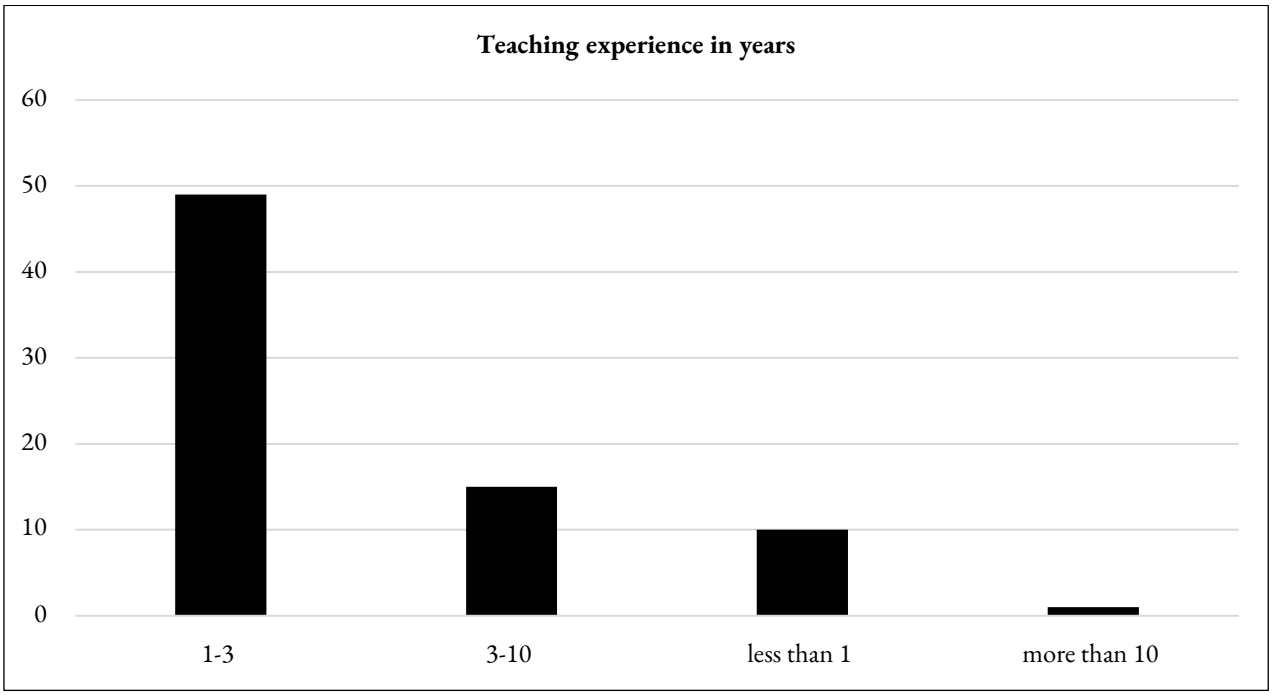
- Demographic information: age, teaching experience, instructional technology expertise;
- Participant's perspective on inclusion: the concept of inclusion (Q1); the role of teachers to make inclusion a reality (Q2), the role of school to make inclusion a reality (Q3), the connection between technology and inclusion (Q4).

As shown in graph 1 the sample varies a lot in terms of age with a dominance of middle age participants (31-50) so that it is not unexpected that the majority of participants (74/95) resulted to have already some work experience at Primary school level, but with a modest seniority (Graph 2).



Graph 1: Age range of the sample

DOI: https://doi.org/10.6092/issn.1970-2221/11585



Graph 2: Teaching experience of the sample

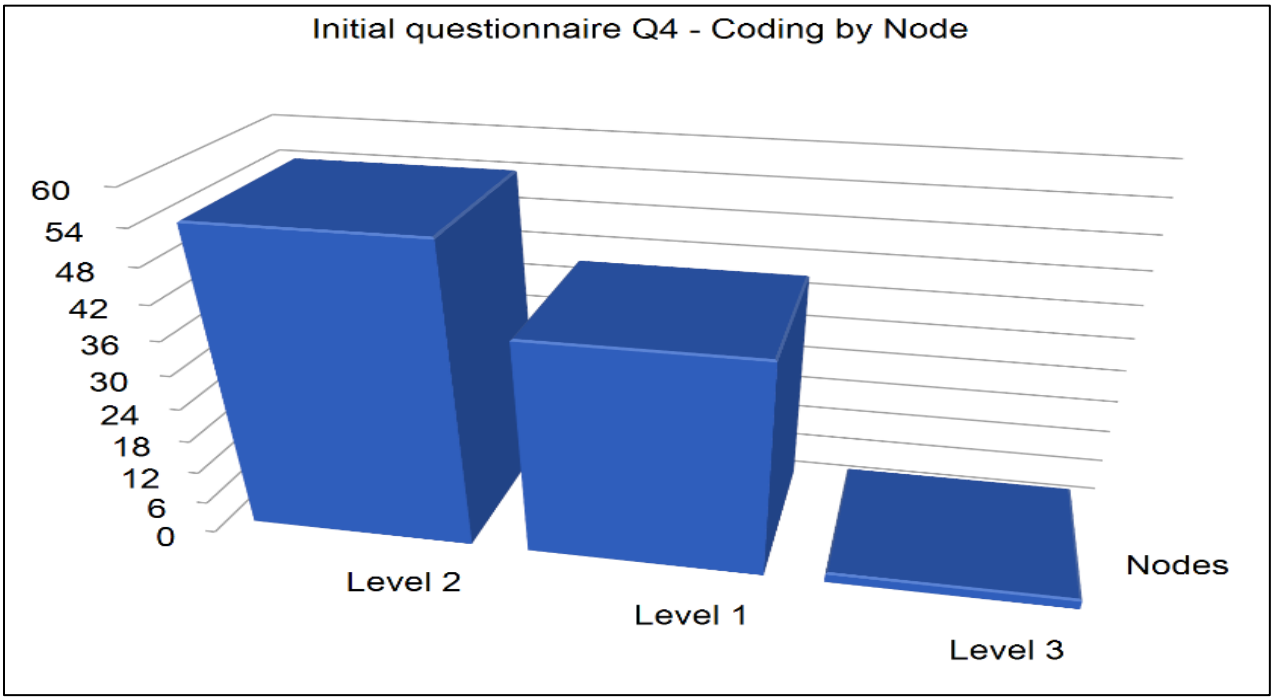
Even if 31 participants state that they already attended courses focussed on the use of technology for instructional use, when they were asked to provide an example on how teachers can improve inclusion in class (Q2), just 1 respondent made a reference to technology as a means/strategy to be used. Most participants reported well known didactical strategies/techniques (e.g., cooperative learning; hands-on workshops; problem-based learning, etc.), but just named or listed them without offering an example on how technology can be integrated in those strategies and contribute to inclusiveness.

The same result was obtained with the question about how school, as institution, can create the conditions to activate inclusive strategies (Q3). This question was even harder for the sample to reply; a significant number of participants, in fact, seems to lack a holistic vision of the education system and replicated almost the same reply as submitted to the previous question. Just few participants highlighted the role of the school as a mediator among the different territorial services and as a change agent capable to create a net of workforce towards inclusion within and outside the school.

But when asked, at the conclusion of the initial questionnaire, what is the connection between technology and inclusion (Q4) there were a number of participants who went beyond generic statements ("their relationship is fundamental"; "technology supports inclusion"; "technology are precious to foster inclusion", etc.) and highlighted functionalities of technology. Those functionalities were mainly referring to technology as: instructional mediators to build meaningful learning environments and improve wellbeing; tools to break down barriers; assistive tools; communication facilitators, etc. and underlined that technology usefulness is connected to teacher and student awareness, that is, when technology is used with intentionality. Those two concepts (awareness and intentionality) were of primary relevance for the course development and were revisited during the final

DOI: https://doi.org/10.6092/issn.1970-2221/11585

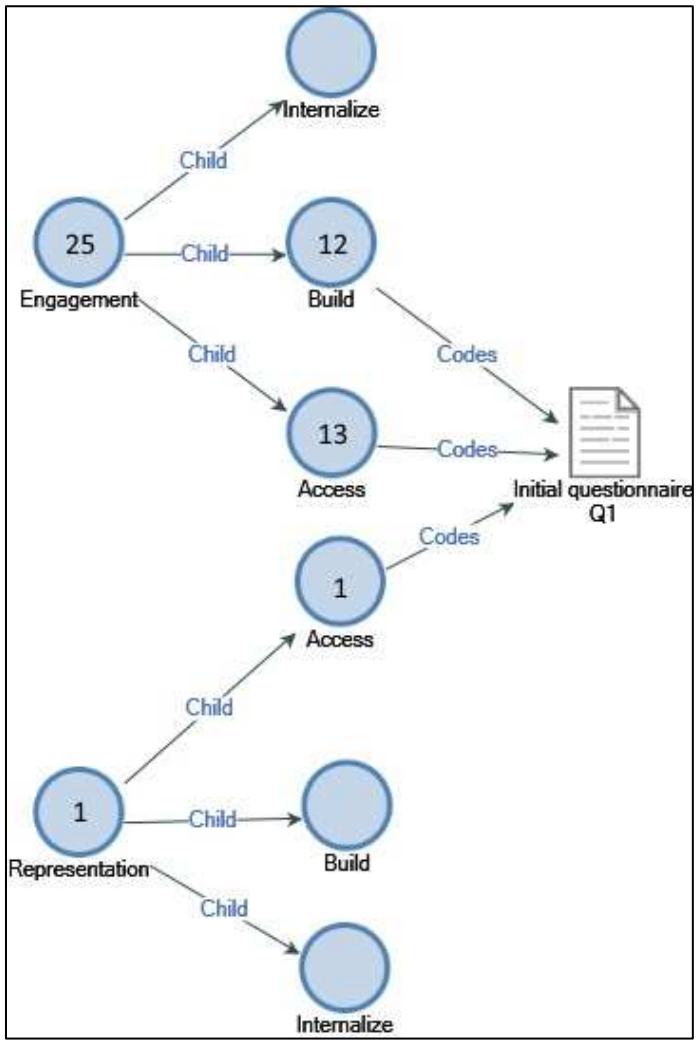
questionnaire, but most of all during the final group work presentation. A deeper level in participants' replies is reached when they provide an example of how technology can be supportive for inclusion.
The graph below (graph 3) shows the number of occurrences of replies coded as level 1 (generic replies without any argument), level 2 (reference to broad areas of technology's functions), level 3 (reference to examples of functions technology can play for inclusion).



Graph 3. Levels of perceived connection between technology and inclusion

The coding process highlights that more than half of the sample is able to recognize major areas of inclusiveness connected to the use of technology (level 2), a considerable number of participants recognize a general connection among inclusion and technology (level 1), and just 2 participants reported an example, among the areas of interest, of a proper use of technology in an inclusive approach.
If we compare coding (level 2 and level 3) related to the specific questions about technology (Q4) with UDL principles the references can be included in the only dimension of "access", mostly referring to its role in motivation and well-being (engagement) and multimodal ways to display and manage information (representation). Those results are completely consistent with the overall initial representation of the concept of inclusion participants shows in Q1.
Graph 4 shows the only UDL categories addressed by the sample: "Engagement" and "Representation" where the almost totality of references are included in the "Engagement" subnodes ("Access" and "Build") with 1 occurrence in "Representation" ("Access").

DOI: https://doi.org/10.6092/issn.1970-2221/11585



Graph 4. UDL category coding graph as resulted in the initial questionnaire

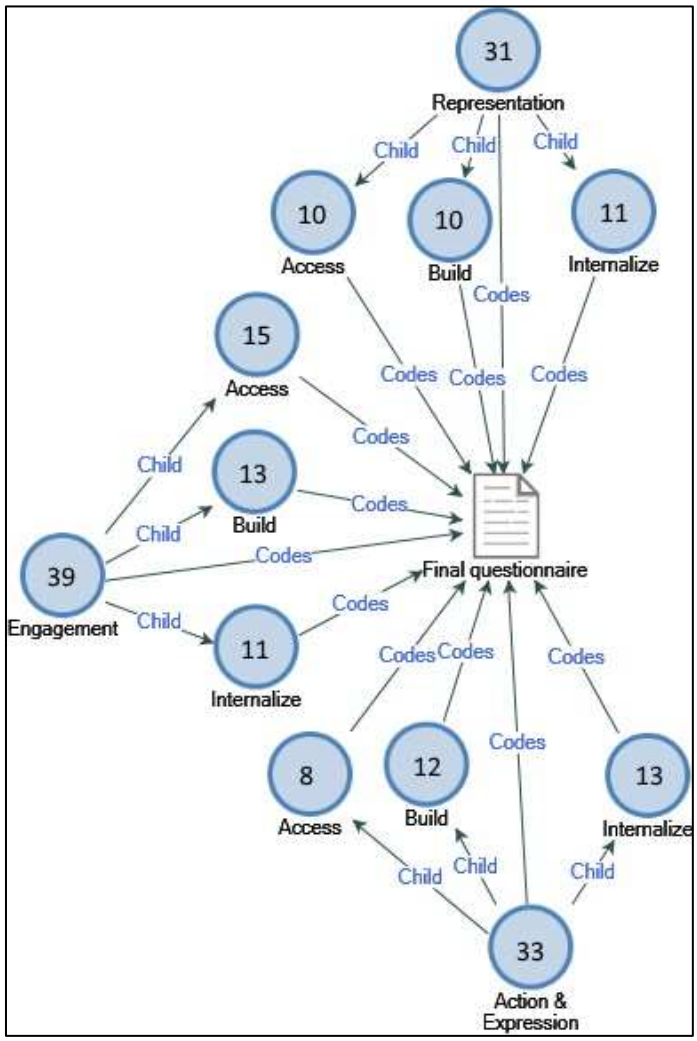
It can be assumed that a priority, in trainee teachers' idea of inclusion in class, is the point of creating a cohesive group of learners who share a comfortable environment able to ensure well-being for every learner. The lack of reference to the other categories of UDL may be attributed to the respondents' difficulty in conceptualizing the process of creation of what they feel as relevant: a working peer group where all learners are active and an effective learning environment for everybody. Examples in this direction are: "Inclusion is making all students part of the class group with their differences"; "Creating a healthy environment where there is active collaboration between learners and teachers"; "To make children feel at ease during the class activities without facing the barrier of their physical/cognitive specificities"; "Inclusion is creating a group that is cohesive in a cozy context"; "Creating a context where everybody feels he/she can be integral part of it".

Since the course design aimed at organizing a set of modular activities (see Table 2) by adopting didactical approaches (performance-based) able to make trainee teachers develop a reflective attitude and experience the effectiveness of some methodological choices (e.g., small group work; heterogeneous group members, inductive sequence of content, etc.) the final questionnaire was organized around two sections:

DOI: https://doi.org/10.6092/issn.1970-2221/11585

- 4 questions aimed at verifying if and how the perceptions about the role of technology affected the categories of UDL: this time clues connected to categories of Engagement, Representation and Action and Reflection were included in the questions;
- 2 questions aimed at collecting trainee teachers' opinions about the course content and approach and the opportunity to use technology on their future role of special needs teachers.

If we compare the results of the initial questionnaire with the data of the final questionnaire we can soon notice that the data collected in the final questionnaire are larger in terms of quantity of ideas/concepts reported in the respondents' replies and appear of higher order thinking. All UDL categories (Graph 5) are fully represented with their three subcategories in the whole sample (100 participants) who submitted the questionnaire and completed all required fields.



Graph 5: UDL category coding graph as resulted in the final questionnaire

A first consideration can be made about the presence of "Action and expression" category which was missing in the initial questionnaire. The following extracts help understanding the impact of the course hands-on

DOI: https://doi.org/10.6092/issn.1970-2221/11585

learning experience had on trainee teachers' raised awareness about the plural and differentiated ways to foster students' active attitude towards learning:

> Through digital "visual organizers" students can build, re-elaborate their knowledge and reflect using metacognition. We have seen how concepts can be organized in visual structures and facilitate the access to knowledge and understanding ("access");
>
> We have used different devices: computers, tablets and mobiles and seen that apps and readers can be used to facilitate the access to information. On the iPad is possible to delete and rewrite your production till you are not satisfied, without leaving traces, differently from the paper. When you work on paper you put "black on white" your difficulties and the differences between you and the others, while digital tools let you change your version easily making your uncertainty not at a front position. I used this device in class with a child with special needs and I was able to adapt the activity in a way she could share it with the classmates ("access");
>
> Applications like speech synthesis can be used by all students to enhance communication abilities (e.g., in foreign languages) since you can modulate the speed to meet different needs, as we have experienced creating e-books and selecting tools for the final project ("build");
>
> Technologies can be cognitive amplifiers, but the teacher role is of primary importance. Thanks to the web, for example, the search for information is easy and fast, but the teacher is a reference for the student who need to learn how to select and organize it in a way he can learn to become autonomous ("internalize");
>
> At school technology can represent a third teacher [along with the disciplinary teacher and the teacher for special needs], able to support students in their learning path making them acquire autonomy, self-regulation and responsibility during, for example, lab activities with cooperative work. ("internalize").

Technologies in terms of devices and software are referred to by trainee teachers as having "bridging" potentialities between skills, attitudes and content access. Trainee teachers highlight how their collaborative experience, mainly when they organized themselves as a group in taking the responsibility of roles in a cooperative approach, offered the chance to discover how powerful is to have a common objective to share in creating, for example, a digital product which is the "bridge" to overcome personal difficulties.
Technologies contribute to creating inclusive spaces with their visual or audio support (multimedia, but also multimodal communication). But being able to let each student express himself/herself and be active in the learning path is, in the trainee teachers' words, connected not only to a full access to content, but also to different variables: the environment, the class group and the teacher's role, all those variables can be influenced by a savvy use of technology.

5. Conclusion

The study aimed at exploring trainee teachers' attitude and perceptions towards the concept of inclusion associated with the use of technologies and verify if the specializing course in Information and Communication Technology could act as a modelling strategy to help trainee teachers acquire an overall instructional design competence necessary to integrate technology in a meaningful way in the direction of UDL principles.

DOI: https://doi.org/10.6092/issn.1970-2221/11585

The course structure allowed a step-by-step orientation in the digital instructional technology area through a sequence of activities that required trainee teachers to exert a gradual autonomy, as individuals and as members of group work. The more and more growing self-confidence and responsibility in the development of the activities was accompanied by the request to discuss and peer assess the reciprocal decision-making process. Being able to experience (with hands-on tasks) the needed balance and smooth connection of the different variables of instructional design with the integration of technology affordances was a key factor for trainee teachers learning process.

The results of the shift from an initial abstract/generic idea of the concept of inclusion to a more comprehensive vision of the role of technologies can play has been discussed thanks to the questionnaires' data (initial and final), but also thanks to the final group work that reified the complexity of the design process.

Lessons plans produced and discussed at the end of the course represented the opportunity to reconstruct all the fragments (activities as units of instruction) in a system of meanings where technology finds its suitable function according to objectives, available resources and selected strategies.

The course's learning path let trainee teachers acquire, along the activity development, an increased awareness in terms of roles technology can play for inclusion.

It is assumed, from the sample's statements, that such shift was due to both the newly acquired knowledge of practical and theoretical aspects connected to digital technology and its potential use, and to the approach used in the course (hands-on, collaborative and with an inductive sequence) which contributed in offering an enhanced opportunity of reflection through a blended format where asynchronous comparison and discussion tools allowed an enriched vision of all groups work.

Even though 75% of the sample had already teaching experience and almost all had previous training opportunities on instructional technology, when the course started they reported just abstract stereotypic concepts. At the end of their learning path they showed, instead, a final argumentative effort by offering a personal perspective through practical examples of connections between equity and participation for inclusion.

The concept of variation (D'Alonzo, 2016) as opposed to standardization (Dalton, 2017) is present in several dimensions of trainee teachers' feedback whose analysis shows a conceptual collocation in the different UDL principles.

Variation affects inclusive strategies in terms of: (1) a newly consolidated idea of a holistic vision of the education system where the support of technologies do not uniquely involve students with disability, but all students and teachers; (2) a major awareness about the directions of application of technologies for access to content, competence development and students' engagement and autonomy; (3) a focus on collaborative strategies that the teacher can adopt to make inclusion an intentional action.

Data gathered during the discussion of the final project (a multimedia artefact) make it clear how trainee teachers recognize as a primary need that each student receive a learning offer in a class context that should appear purposeful and motivating. Those characteristics are selected as inclusive keys and, if crossed with the researcher's observations during the course activities, also highlight how trainee teachers were able to develop a professional vision in the direction of transferability of "lesson learnt" to the school system in consistency with UDL principles.

DOI: https://doi.org/10.6092/issn.1970-2221/11585

References

Armstrong, A.C., Armstrong, D., Spandagou, I. (2010). *Inclusive Education: International Policy & Practice*. London: Sage Publications.

Bardin, L. (1977). *L'Analyse de Contenu*. Paris: Presses Universitaires de France.

Baxter, P. & Jack, S. (2008). Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers. *The Qualitative Report*, 13(4), 544-559. Retrieved from https://nsuworks.nova.edu/tqr/vol13/iss4/2.

Center for Applied Special Technology (CAST) (2018). *Universal Design for Learning Guidelines version 2.2.* Retrieved from http://udlguidelines.cast.org.

D'Alonzo, L. (2016). *La differenziazione didattica per l'inclusione. Metodi, strategie, attività*. Erickson, Trento.

D'Alonzo, L. (2018). *Pedagogia speciale per l'inclusione*. Milano: Schole.

Dalton, E. M. (2017). Beyond Universal Design for Learning: Guiding Principles to Reduce Barriers to Digital & Media Literacy Competence. *The Journal of Media Literacy Education*, 9(2), 17–29.

Downing, J. E. (2002). *Including students with severe and multiple disabilities in typical classrooms: Practical strategies for teachers* (2nd ed.). Paul H. Brookes, Baltimore.

Evmenova, A. (2018). Preparing Teachers to Use Universal Design for Learning to Support Diverse Learners. *Journal of Online Learning Research*, 4(2), 147-171.

Fedeli, L., Pennazio, V. (2019). An Exploratory Study on Teacher Training: The Use and Impact of Technologies Within a Specialization Course for Special Needs. In B. M. Rice (Ed.), *Global Perspectives on Inclusive Teacher Education*, Hershey, PA: IGI Global, (pp. 58 – 81).

Florian, L. & Linklater, H. (2010). *Preparing teachers for inclusive education: using inclusive pedagogy to enhance teaching and learning for all.* Cambridge Journal of Education, 40(4), 369-386.

Friesem, Y. (2017). Beyond Accessibility: How Media Literacy Education Addresses Issues of Disabilities. *Journal of Media Literacy Education*, 9 (2), 1-16.

Ghedin, E., & Mazzocut, S. (2017). Universal Design for Learning per una valorizzazione delle differenze: un'indagine esplorativa sulle percezioni degli insegnanti. *Giornale italiano della ricerca educativa*, 18, 145-162.

Jimenez, T. C., Graf, V. L., & Rose, E. (2007). Gaining access to general education: The promise of universal design for learning. *Issues in Teacher Education*, 16(2), 41-54.

Kershner, R. (2007). *What do teachers need to know about meeting special educational needs? In L. Florian (Ed.), The Sage handbook of special education*, London: Sage, (pp. 486–498).

King-Sears, M. (2009). Universal design for learning: Technology and pedagogy. *Learning Disabilities Quarterly*, 32, 199-201.

DOI: https://doi.org/10.6092/issn.1970-2221/11585

Kurtts, S.A. (2006).Universal Design for Learning in Inclusive Classrooms. *Electronic Journal for Inclusive Education*, 1(10), 1-16.

Hall, T. E. Meyer, A. & Rose, D. H. (2012). An Introduction to Universal Design for Learning. In T. E. Hall, A. Meyer, and D. H. Rose (Eds), *Universal Design for Learning in the Classroom: Practical Applications*, New York: Guilford Publications, (1-8).

Leach, A.M. (2017). Digital Media Production to Support Literacy For Secondary Students with Diverse Learning Abilities. *Journal of Media Literacy Education*, 9 (2), 30-44.

MIUR. Decree 10 September 2010, n. 249 (IT).

MIUR. Decree 9 August 2013, n. 706 (IT).

Morra, T., & Reynolds, J. (2010). Universal Design for Learning: Application for Technology-Enhanced Learning. *Inquiry: The Journal of the Virginia Community Colleges*, 15 (1), pp. 43-51. Retrieved from https://commons.vccs.edu/inquiry/vol15/iss1/5.

OECD (2017), *PISA 2015 Results (Volume III): Students' Well-Being*. Paris: OECD Publishing. Retrieved from http://dx.doi.org/10.1787/9789264273856-en

Perla, L. (2013) (Ed). *Per una didattica dell'inclusione. Prove di formalizzazione*. Lecce: Pensa Multimedia.

Rice, B. M. (2019) (Ed.). *Global Perspectives on Inclusive Teacher Education*. Hershey, PA: IGI Global.

Riva, G. (2020). *I social network*. Bologna: Il Mulino.

Robinson, D. (2017). Effective inclusive teacher education for special educational needs and disabilities: Some more thoughts on the way forward. *Teaching and Teacher Education*, 61, 164-178.

Rose, D.H., & Meyer, A. (2002). *Teaching every student in the digital age: Universal Design for Learning*. Alexandria, VA: Association for Supervision and Curriculum Development.

Rose, D. H., & Strangman, N. (2007). Universal Design for Learning: Meeting the challenge of individual learning differences through a neurocognitive perspective. *Universal Access in the Information Society*, 5(4), 381–391.

Wood, K. D., Algozzine, B., & Avett, S. (1993). Promoting cooperative learning experiences for students with reading, writing, and learning disabilities. *Reading and Writing Quarterly*, 9, 369-376.

Yin, R. K. (2003). *Case study research: Design and methods* (3rd ed.). Thousand Oaks, CA: Sage.

Yin, R. K. (2014). *Case study research: Design and methods* (5th ed.). Thousand Oaks, CA: Sage.

Laura Fedeli is associate professor in Didactics and Special Pedagogy in the Department of Education, Cultural Heritage and Tourism at University of Macerata (Italy) where she is also the departmental delegate for e-learning.
Contact: laura.fedeli@unimc.it

DOI: https://doi.org/10.6092/issn.1970-2221/11585