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Tendenze emergenti nel campo della ricerca empirica in educazione

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Educational Robotics for Special Needs Students: Teachers' Perspectives on Pre-service Training

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ROBOTICA EDUCATIVA PER STUDENTI CON BISOGNI SPECIALI: IL PUNTO DI VISTA DEGLI INSEGNANTI SULLA FORMAZIONE PRE-SERVIZIO

Abstract

Since the introduction of LOGO by Seymour Papert in 1980 and the constructivist theories, after the teaching machines of Skinner, technology, robots and robotics activities have been viewed as effective educational tools. Multiple studies have demonstrated that robotics is a valuable device for special education students too. The present study is part of a particularly novel and challenging trend of research that intends to fill a knowledge gap regarding the perspectives and concerns of learning support teachers on educational robotics. Particularly by questioning teachers who have not received training in the use of educational robotics. In this exploratory study, 125 Italian pre-service learning support teachers were surveyed at the end or during their course specialization to determine their awareness and comprehension of educational robotics usage with students with special needs. The survey reveals that support teachers are not adequately trained to use educational robotics and that they are generally unfamiliar with it and they rarely employ it.

Keywords: Educational robotics; Inclusive education; Learning strategies; Learning support teachers; Special needs students.

* I paragrafi 1 e 2 e 5 sono da attribuire a F. Agrusti; i paragrafi 3 e 4 sono da attribuire ad G. Bonavolontà.

1. Rationale of the research

It is difficult to ignore how pervasive technology is in everyone's lives today. Particularly in the field of robotics, significant progress has been made in every field, beginning with the development of industrial robotics and continuing through medical robotics and, in the most recent updates, in educational robots. Since Seymour Papert introduced the computer language LOGO in 1980, and before with the idea of the teaching machine of Burrhus Frederic Skinner, there has been widespread agreement that technology can be a successful aid in education and that the starting point is data and constructs based on empirical data supported by students' experience. For Papert, robots and robotics activities can be effective educational tools and the creation of something physical to support what is built «in the brain» through cognitive artefacts makes the process of building that thing easier and more enjoyable (Skinner, 1964; Papert, 1980, 1984).

Hereafter, we use the term *Educational Robotics* (ER) to denote activities that engage children and teens in learning by utilising basic robots to pique their curiosity and inspire them to learn more about a variety of academic disciplines, including but not limited to STEM (Science, Technology, Engineering, and Mathematics).

Several studies have documented the usefulness and effectiveness of ER in the education of typical students in general (Benitti, 2012; Mubin *et al.*, 2013; Beltrametti *et al.*, 2017; Athanasiou *et al.*, 2018; Talan, 2021), but only a few have already explored the use of ER with special needs students (Damiani *et al.*, 2013; Businaro *et al.*, 2014; Agatolio *et al.*, 2016). ER can be utilised as a tool to promote individual development, creativity, teamwork, and communication, as well as problem-solving and computational reasoning (Kandlhofer & Steinbauer, 2016; Rubinacci *et al.*, 2017).

As stated previously, we could refer to ER as an interdisciplinary subject because it not only allows students to learn robotics but also acts as a means to learn various other disciplines. It is distinguished by two key characteristics: computational reasoning and an emphasis on error (as specified by Papert). Errors are significant as learners should analyse them to gain new knowledge. It is interesting to see how ER has already been integrated into school curricula, encompassing all operational and practical elements, to encourage children to acquire new knowledge through gaming (Ribeiro *et al.*, 2011; Agostini *et al.*, 2014; Beltrametti *et al.*, 2017). Computational thinking is one of the most important learning objectives of ER since it represents each person's effort to ensure that the other understands what he or she wants to say through clear instructions, fostering John Dewey's paradigm of *learning by doing*.

Cheng, Sun, and Chen recognised the significant potential in the educational application of robots (Cheng *et al.*, 2015). They have characteristics that make them functional in supporting pupils' acquisition of knowledge and skills. Robots can facilitate learning precisely because they involve children and make learning more interactive and interesting. This is because, according to Papert, children develop a fascination with technology very early in their lives. They begin relating to it at a young age and, without reading instructions or manuals, construct their own technological learning by accident.

Several studies classify educational robotics experiences into two macro-categories. First, robotics is a learning tool. These educational activities focus on robotics-related topics including robot construction, programming, and artificial intelligence and attempt to create a learning environment where students actively solve authentic challenges (AI). The second group uses robotics as a learning strategy. Thus, robotics can aid transdisciplinary teaching and learning (usually STEM-based) (Alimisis & Kynigos, 2009; Alimisis, 2012; Scaradozzi *et al.*, 2019; Sapounidis & Alimisis, 2021).

In ER activities, robots and robotics serve as learning tools to assist teachers and students in the learning process (Miglino *et al.*, 1999; Menegatti & Moro, 2010). Students can learn about physics, for instance, by programming a robot equipped with sensors and actuators during a science lecture (Mubin *et al.*, 2013). Xia and Zhong, in a meta-analysis of more than twenty papers, demonstrated that ER fosters students in multiple ways, including attitude changes (e.g., self-efficacy), skill development (e.g., computational thinking) and conceptual understanding (e.g., programming) (Xia & Zhong, 2018). Conversely, few past studies have demonstrated that ER did not result in substantial gains in student achievement. For instance, in the field of physics, while students' knowledge of gear motion and function improved after robotics lessons, the majority could not correctly explain mechanical advantage (Chambers *et al.*, 2008).

When compared to other technological learning aids such as computers, tablets, mobile devices, and interactive whiteboards, ER has the potential to increase communication skills and foster teamwork since students need to collaborate with peers to solve the tasks assigned, and because of the emotional engagement offered by the physical presence of the robot (Mubin *et al.*, 2013). The use of ER in the classroom has the potential to provide an accommodating learning environment that tailors to the requirements of each student.

Not only does robotics make it simpler and faster to learn at school, but it may also be utilised for children with severe physical and mental

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disabilities (Encarnação *et al.*, 2017; Albo-Canals *et al.*, 2018; Catlin & Blamires, 2019; Pivetti *et al.*, 2020) even in an inclusive hybrid classroom. Hybrid classrooms are developed in hybrid spaces, i.e., spaces produced by the constant connection of people to the Internet via mobile or fixed devices. From an educational point of view, these spaces offer the possibility of decreasing the rigidity of institutional contexts from a perspective of openness and transversality (Trentin, 2019).

The term *special needs* covers a wide spectrum of learning problems and disabilities. In the present study, we consider purposely education's specific needs, not disabilities. Students with *special educational needs* (SEN) have more learning challenges than most children their age, requiring special instruction (Stow & Selfe, 2018). Italy's SEN inclusion model is quite sophisticated, given that, since 1971, several guidelines and legal procedures have been created to integrate SEN students into mainstream education classrooms (Zambelli & Bonni, 2004). Inclusion of SEN students is impossible without specialized *learning support teachers* (LST), and technology has the potential to make both teaching and learning more enjoyable (Canevaro, 1986).

Italian law assigns LSTs a crucial responsibility in ensuring the inclusion of SEN children and integrating all students in the group class. LSTs get a post-degree specialization after a year of multidisciplinary coursework, workshops, and internship. As stated above, ER matches LST's interdisciplinary and inclusive nature (Kynigos *et al.*, 2018; Catlin & Blamires, 2019; Daniela & Lytras, 2019).

Due to the high level of complexity inherent in using ER, such as understanding the robot's interaction in the environment, it may seem inappropriate to SEN students.

However, modern ER robots and equipment are intuitive and require minimal technological know-how. Di Battista *et al.* recognised that using ER does not require particular computer science skills or knowledge, and using them assumes no robot-specific knowledge by both students and teachers (Di Battista *et al.*, 2020). They also show that in ER teacher training, a short introduction to robots and coding is adequate, since teachers rapidly get acquainted with educational robots and may anticipate employing ER for their didactical objectives with the particular class they are teaching without additional assistance (e.g., robot coding exercises are assigned to a group of students with a child with impaired mobility).

Most Italian teachers consider ER a useful tool for improving SEN students' skills, and they report that educational robots may assist autistic and ADHD students in geography, arithmetic, and science (Pennazio, 2015; Agatolio *et al.*, 2016).

In this exploratory research, we surveyed Italian pre-service LSTs during or right after their course specialization about their awareness and understanding of ER usage with SEN students.

2. Purpose of the research

Technological development plays an important role in helping students with disabilities, promoting school inclusion. Indeed, technology can facilitate, support and increase levels of learning. In recent years, educational robotics has been increasingly used in teaching activities, as it makes learning more engaging and stimulating. Specifically, robotics can promote dialogue, communication and student interaction. Interacting with a robot can be easier for a child with autism spectrum disorder because the robot is not unpredictable compared to a human interlocutor. Therefore, the use of new technologies at school is important and it is also important to know what the teachers' opinion of educational robotics is.

With this in mind, we asked ourselves what the impact of educational robotics is on teachers. To this end, the present research was initiated with the aim of understanding whether teachers use robotics and whether they consider it effective as a teaching aid in activities with students with disabilities (Conchinha *et al.*, 2015; Agatolio *et al.*, 2016; Encarnação *et al.*, 2017; Di Battista *et al.*, 2020; Pivetti *et al.*, 2020).

In particular, the empirical research subject of this exploratory study was to describe LST attitudes and beliefs towards ER, through the administration of a questionnaire containing 29 questions, two of which were open-ended. The primary purpose was to determine if they were familiar with educational robotics and, if so, where they retrieved the information they had.

Since the purpose of the study was to investigate the LSTs' knowledge, awareness, and opinions regarding ER, a video explanation (available here: https://youtu.be/e0tJALO9-Dw) of the concept of ER was introduced only in the middle of the questionnaire to clarify what was meant by ER and to what field of application the subsequent questions pertained.

However, before watching the video, each respondent was asked to provide a definition of ER based on their knowledge and experience, so respondents would not rely on the definition contained in the video but instead would try to provide their own explanation. If the respondent had no prior knowledge or experience with educational robotics, a tentative answer was also requested.

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The premise of the exploratory study is that although LSTs have a strong acceptance of the use of ER in schools and specifically with SEN students, this acceptance is based more on a superficial understanding of the theory and concept behind ER than on actual field experience.

3. Materials and methods

During their one-year course of the specialization, an exploratory survey was conducted in the period of January 2022 to determine the perceptions of LST regarding the use of ER. The qualitative-quantitative survey, conducted using a multiple-choice questionnaire and administered to approximately 125 subjects, aimed to determine whether support teachers consider the use of educational robotics as a teaching aid for disabled students to be effective.

The sample is non-probabilistic with mixed contact techniques, so the sample does not allow generalizations. In the first phase, a convenience sample was used, given the need to interview subjects with specific characteristics (being a support teacher or attending a course to become one), and for feasibility reasons. In the second phase, a voluntary and snowball sample was used, widening participation options through links on social networks. Subjects were asked for main biographical data, information about their professional career, opinions regarding technology in education and then opinions and experience regarding educational robotics.

The survey was uploaded onto Google Forms and the respondents were able to access the online compilation through the related link. It was mainly submitted through the distance delivery platform of the Department of Education Sciences of the University of Roma Tre and various social applications, such as Facebook and WhatsApp.

It is an exploratory survey questionnaire, anonymous and self-administered online, consisting of no. 29 questions of which 27 were multiple choice and 2 open questions. The survey was divided into the following sections corresponding to several blocks of questions:

- personal data (questions no. 1 to no. 2);
- data on his or her professional career (questions 3 to 12);
- opinions on technology in education (questions 13 to 15);
- opinions on educational robotics (questions 16 to 29).

The questions relating to the survey of opinions included items on a 5-point Likert scale.

The first block of questions (biographical data section) contains items aimed at surveying the subjects' socio-demographic information (age,

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gender). The second block of questions contains items aimed at detecting information about their experience as a teacher (if any), whether they currently work with SEN students, what type of disability they face and which teaching strategies they adopt. The third section of the survey aimed to investigate teachers' beliefs on the use of technology for inclusion in education. The fourth and last block of questions concerns teachers' opinions about educational robotics at school, and any direct experience of use with disabled students.

4. Results

The data was collected using a CAWI-administered Google Forms web questionnaire with the anonymous distribution. Here we present a preliminary analysis of the results obtained through frequency analysis.

This preliminary analysis aims to provide some aspects of teachers' perspectives on educational robotics and disability. In the future, additional and more comprehensive interpretation of the data will be required.

The investigated group consists primarily of women (F = 114, M = 11). The predominant age range is 32 to 41 (35.2%). Most participants are public school teachers (66.4%) and TFA course participants (60.8%). A sizeable proportion (52.8%) had experience as occasional support teachers through annual substitutions.

4.1. *Attitudes towards technology in education*

Following is a discussion of the respondents' perspectives on technology in education. Specifically, when asked «In your opinion, can technology help school inclusion?» the majority of respondents (68%) view technology as an integrative mediator that can facilitate school integration, while 31% view it as an indispensable mediator, just one respondent answered that the mediator is ineffective. In addition, respondents hold a positive view of the use of technology to address physical and intellectual disability-related issues (item 14a, item 14b, item 14c, item 14d), as well as the view that technology has a beneficial impact on teaching (item 14e), in fact more than 80% of the sample states that in their personal experience, they have found that the impact of technology on teaching is appreciable (item 14f) and over 75% are agree that technology is used to support programmes to individualise education according to the individual needs of students (item 14g) (*Fig. 1*).

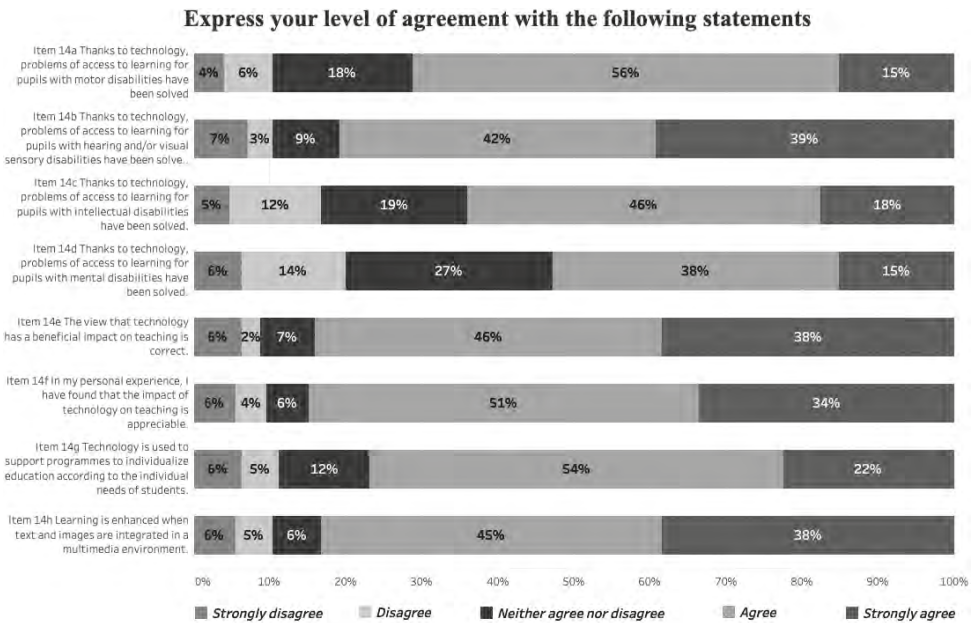

Figure 1. – Attitudes towards technology in education.

The descriptive data pertaining to the instructors' perspectives on the effectiveness of technology in education are shown in *Table 1*. One sample *t*-test indicated that respondents agreed or strongly agreed with each statement (every mean has a value > 2.5; *Tab. 1*).

Table 1. – Descriptive statistics.

	n	*M*	*SD*	*t*	*df*	*Sig.*
[Item 14a] Thanks to technology, problems of access to learning for pupils with motor disabilities have been solved.	125	3.72	0.93	44.32	124	< 0.001
[Item 14b] Thanks to technology, problems of access to learning for pupils with hearing and/or visual sensory disabilities have been solved.	125	4.02	1.12	39.99	124	< 0.001
[Item 14c] Thanks to technology, problems of access to learning for pupils with intellectual disabilities have been solved.	125	3.60	1.06	37.88	124	< 0.001

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	n	*M*	*SD*	*t*	*df*	*Sig.*
[Item 14d] Thanks to technology, problems of access to learning for pupils with mental disabilities have been solved.	125	3.41	1.10	34.68	124	< 0.001
[Item 14e] The view that technology has a beneficial impact on teaching is correct.	125	4.07	1.06	42.79	124	< 0.001
[Item 14f] In my personal experience, I have found that the impact of technology on teaching is appreciable.	125	4.03	1.03	43.71	124	< 0.001
[Item 14g] Technology is used to support programmes to individualize education according to the individual needs of students.	125	3.81	1.04	40.92	124	< 0.001
[Item 14h] Learning is enhanced when text and images are integrated in a multimedia environment.	125	4.06	1.07	42.28	124	< 0.001

Note: Response scale: 1 = *strongly disagree*; 5 = *strongly agree*. For one-sample *t*-test: 95% confidence intervals, two-tailed.

Accordingly, the teachers to item 15 («In your opinion, with regard to students with special educational needs – SEN –, technology is a tool:») believe that technology is a useful tool for individualization concerning SEN students (31%); that it is a compensatory tool (25%); that it is useful for improving the quality of instruction (22%); claim it is useful for cognitive enhancement (14%); claim it is an assistive tool (8%).

4.2. *Experiences and views on ER*

When asked «Have you ever had any experience with educational robotics at school?», 70% of the subjects say that had never had any experience; 15% said they had had experience and had used it at least once in class; 9% had an experience but had never seen it used in one of their classes; while 6% said they had seen it used at least once in class.

Overall, As regards opinions on educational robotics, the interviewees believe that it can have a very high effect on students in general (item 20a; 29% very much agree, 52% agree, 10% uncertain, 3% disagree, 6% very much disagree) even those with disabilities (item 20b; 26% very much agree, 50% agree, 14% uncertain, 6% disagree, 5% very much disagree) and that it can reduce the problems of access to learning for students with special educational needs (item 20c; 21% very much agree, 46% agree, 23% uncertain, 6% disagree, 4% very much disagree) (*Fig. 2*).

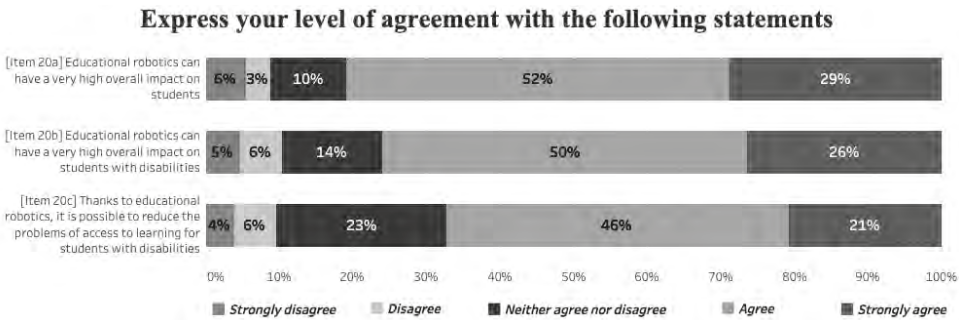

Figure 2. – Views on ER.

The descriptive data pertaining to the instructors' perspectives on the usefulness of ER for students and SEN students are shown in *Table 1*. The results of one sample *t*-test indicated that ER is seen as being highly useful for each of the claims that were suggested. Actually, every mean has a value much higher than the mean point on the response scale (= 2.5; *Table 2*).

Table 2. – Descriptive statistics.

	n	*M*	*SD*	*t*	*df*	*Sig.*
[Item 20a] Educational robotics can have a very high overall impact on students.	125	3.95	1.01	43.53	124	< 0.001
[Item 20b] Educational robotics can have a very high overall impact on students with disabilities.	125	3.87	1.02	42.28	124	< 0.001
[Item 20c] Thanks to educational robotics, it is possible to reduce the problems of access to learning for students with disabilities.	125	3.74	0.98	42.58	124	< 0.001

Note: Response scale: 1 = *strongly disagree*; 5 = *strongly agree*. For one-sample *t*-test: 95% confidence intervals, two-tailed.

Moreover, teachers believe that educational robotics, concerning students with special educational needs, has the potential to facilitate the development of the ability to solve problems and make decisions (item 22a; 38% very much, 42% quite, 10% don't know, 8% a slightly, 2% not at all); the ability to design, organise and plan (item 22b; 35% very much, 46% quite, 11% don't know, 6% a slightly, 2% not at all) the ability to analyse, discriminate and think critically (item 22c; 41% very much, 34% quite,

14% don't know, 10% a slightly, 2% not at all); the ability to collaborate, cooperate and share (item 22d; 34% very much, 50% quite, 9% don't know, 6% a slightly, 1% not at all); the ability to evaluate, understand and manage errors (item 22e; 34% very much, 45% quite, 13% don't know, 6% a slightly, 2% not at all); the ability to generalise and transfer what has been learnt to other areas (item 22f; 42% very much, 33% quite, 14% don't know, 10% a slightly, 1% not at all) (*Fig.* 3).

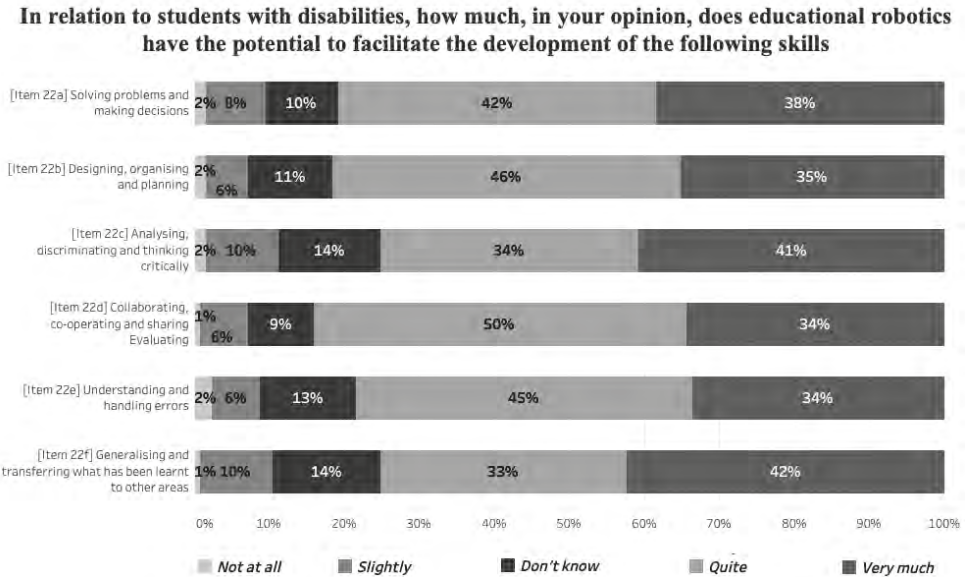

Figure 3. – Views on the potential of ER in education.

4.3. *Dimensions and competencies enhanced by ER with SEN*

Again about students with special educational needs, teachers think that educational robotics has the potential to facilitate development in the following dimensions: social, relational and affective, empathy (item 23a; 38% very much, 34% quite, 9% don't know, 16% a slightly, 3% not at all); motivational (involvement, interest and participation) (item 23b; 31% very much, 55% quite, 10% don't know, 2% a slightly, 2% not at all); expressive, creative and divergent thinking (item 23c; 35% very much, 46% quite, 10% don't know, 7% a slightly, 2% not at all); praxical-motor (item 23d; 38% very much, 41% quite, 11% don't know, 7% a slightly, 2% not at all) (*Fig. 4*).

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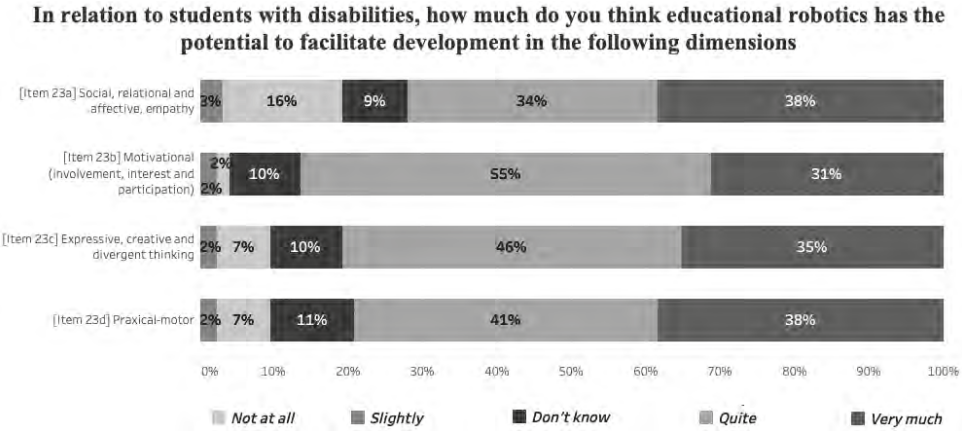

Figure 4. – Dimensions enhanced by ER with SEN.

Regarding competencies, overall teachers think that educational robotics can support the development of key competencies for lifelong learning in students with disabilities. Specifically, the key competences taken into consideration are the following: functional literacy competence (item 24a; 44% very much, 35% quite, 10% don't know, 8% a slightly, 2% not at all); multilingual competence (item 24b; 43% very much, 32% quite, 9% don't know, 14% a slightly, 2% not at all); competence in mathematics, science, technology and engineering (item 24c; 28% very much, 63% quite, 5% don't know, 2% a slightly, 2% not at all); digital competence (item 24d; 29% very much, 60% quite, 8% don't know, 2% a slightly, 2% not at all); personal, social and learning to learn competence (item 24e; 37% very much, 55% quite, 10% don't know, 2% a slightly, 2% not at all); citizenship competence (item 24f; 31% very much, 46% quite, 8% don't know, 6% a slightly, 2% not at all); entrepreneurial competence (item 24g; 39% very much, 30% quite, 15% don't know, 14% a slightly, 2% not at all); competence in cultural awareness and expression (item 24h; 40% very much, 24% quite, 15% don't know, 17% a slightly, 4% not at all) (*Fig. 5*).

Furthermore, for item 25 («In your opinion, concerning students with special educational needs (BES), educational robotics is a tool:») 26% of the sample believe that it is useful for cognitive enhancement, 24% believe that educational robotics is a useful tool for SEN students to personalise and individualise; 23% believe it is useful for improving the quality of teaching, 12% believe it is a compensatory tool while for 9% it is an assistive tool and the others answer «Other».

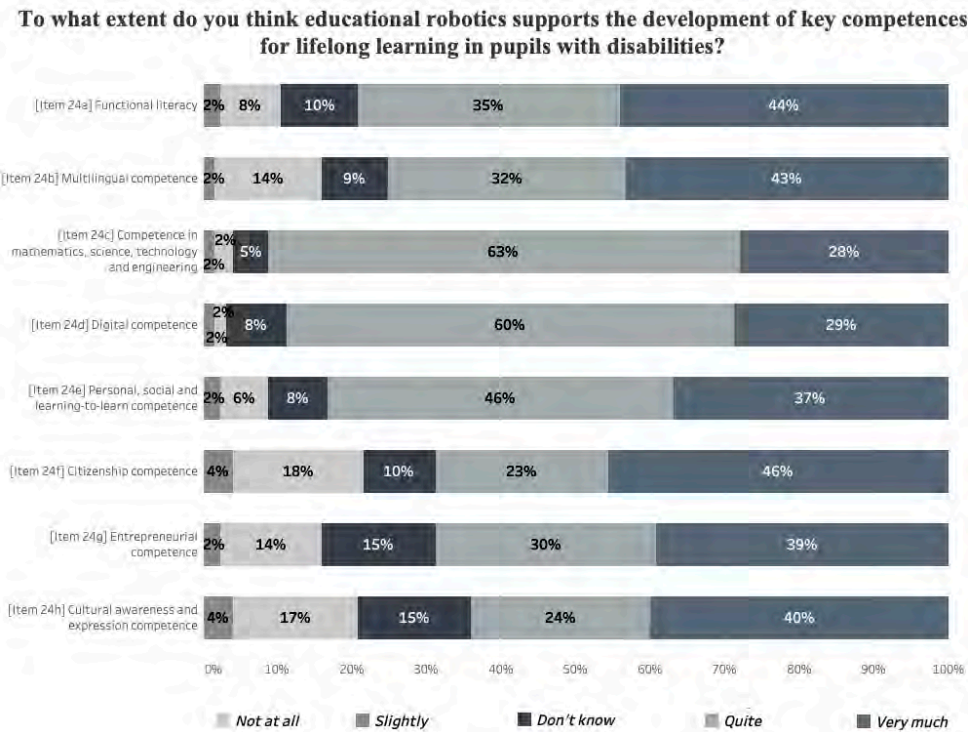

Figure 5. – Competencies enhanced by ER with SEN.

4.4. *Potential of ER with SEN*

On item 27 («Overall, did/can educational robotics bring benefits to the performance of your profession?») the majority of respondents (80%) believe that educational robotics could bring benefits to the performance of their profession, while only 2% answered negatively and 18% said «Don't know».

Moreover, on item 28 («Do you consider your current skills in educational robotics to be sufficient?»), 84% of the teachers consider their current skills in this field to be insufficient, while 6% consider them to be sufficient and the others answer «Don't know».

Finally, when asked «Do you consider educational robotics a tool for inclusion?», 85% of the sample believe that educational robotics, if used

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in the right way, can be a tool for inclusion; 13% say that it could be, but only for the development of certain skills and 2% answer «No, I don't think it helps inclusion».

5. Discussion

This exploratory study involves the administration of a questionnaire consisting of 29 questions, of which two were open-ended, to 125 LSTs to determine their opinions on the use of ER in school. The primary objective was to determine whether they were familiar with educational robotics and, if so, in what context. Even while almost 70% of the respondents did not have a strong familiarity with it, 30% of them had either direct or indirect experience with it, either in the context of school or outside of school.

In accordance with previous Italian research, in this exploratory study, we found that pre-service and in-service learning support instructors had a favourable attitude toward ER for SEN children (Agatolio *et al.*, 2016; Di Battista *et al.*, 2020). According to the research school initiatives using ER improve the communication skills of children with motor difficulties or ASD (Adams & Cook, 2014; Albo-Canals *et al.*, 2018). On the other hand, teachers may not have any recommendations for learning objectives that the robot might make learners accomplish.

LSTs were then asked to describe educational robotics using their own words and knowledge. Even those who did not know how to define it attempted to answer. Some of their responses were precise and detailed, while others were more general and instructional (e.g., «A technological tool to support teaching»).

Regarding the collection of data on educational robotics experiences, the majority of respondents agreed that it can have a significant impact on students with disabilities and reduce problems with access to learning.

The extent to which educational robotics supports the development of key competencies for lifelong learning in students with disabilities is another very interesting finding. Although most respondents had marginal or no knowledge of educational robotics, more than 60% of them believes that educational robotics significantly enhances mathematical, scientific, technological, and engineering competencies, as well as digital competencies in general. This may suggest that educational robotics has a positive effect on scientific competencies, as opposed to multilingual competencies, for which only 32% of respondents chose «Very much».

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Based on the findings, educational robotics is a useful tool for personalization/individualization and cognitive enhancement for students with special educational needs. More than one respondent believed that all answers were correct «because disabilities have distinct modalities and robotics provides different devices».

LSTs were asked if they believe their current skills to be adequate and if they believe it to be a factor in school inclusion. According to the results, 80% of respondents believe that their current knowledge of the topic is insufficient, and 85% of respondents believe that educational robotics can be a tool for inclusion if used appropriately. We believe that this favourable sentiment will convert into the actual implementation of ER sessions with SEN students since the research shows a positive relationship between attitudes and actions (Benitti, 2012; Conchinha *et al.*, 2015; Daniela & Lytras, 2019).

Despite its results, the study has some inherent limitations. We decide to do not to consider gender distinctions, since one of the study's shortcomings was the gender and education discrepancy between the male and female participants (91% of respondents were female). Consistently to earlier studies on educators' attitudes in Italy, a large proportion of teachers are female (Agatolio *et al.*, 2016; Di Battista *et al.*, 2020). Furthermore, the majority of respondents stated that they were currently attending the course, while only 19% had already specialised as LTS. It would be ideal for future studies to involve a greater number of participants and guarantee that they are representative of the broader population.

Accordingly to previous research, given that just around 20% of respondents were acquainted with ER and have used it in the classroom, we strongly believe that future studies should adopt a longitudinal research design to better understand how educators' opinions, practices, and competence evolve over time (Di Battista *et al.*, 2020).

In conclusion, the survey reveals that support teachers are not adequately trained to use educational robotics and that few teachers are familiar with and employ it themselves. However, they believe it is a tool that, when used appropriately, can aid school integration. Society is undergoing a continual transformation, resulting in a shift in technology and, by extension, in school instruction.

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Riassunto

Dall'introduzione di LOGO da parte di Seymour Papert nel 1980 con le teorie costruttiviste, dopo le macchine per insegnare di Skinner, la tecnologia, i robot e le attività ad essi correlate sono stati considerati come strumenti educativi efficaci. Numerosi studi hanno dimostrato che la robotica educativa è uno strumento prezioso anche come ausilio della didattica a sostegno degli alunni con disabilità. Il presente studio fa parte di un filone di ricerca particolarmente nuovo e stimolante, che intende aumentare la conoscenza riguardo le prospettive e le preoccupazioni degli insegnanti specializzati circa l'uso della robotica educativa in classe, senza anticipare loro una formazione specifica sulla robotica educativa. In questo studio esplorativo, 125 partecipanti di diversi cicli del «Corso di formazione per il conseguimento della specializzazione per le attività di sostegno didattico agli alunni con disabilità» sono stati intervistati alla fine o durante il corso di specializzazione per determinare la loro consapevolezza e comprensione dell'uso della robotica educativa con studenti con disabilità. L'indagine rivela che questi futuri insegnanti non sono adeguatamente formati all'uso della robotica educativa e che generalmente non la conoscono e la utilizzano raramente.

Parole chiave: Educazione inclusiva; Insegnanti specializzati; Robotica educativa; Strategie di apprendimento; Studenti con bisogni educativi speciali.

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