WeDo-WeCANDo: A proposal for a co-education program in Adapted Physical Education

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Abstract: The use of technology in education is applied in recent years in the field of special education and extends to the course of adapted physical education, in order to develop and enhance the skills of students. In the present study, the effect of the implementation of an educational robotics training program (Lego WeDo 2.0) and Information and Communication Technologies (ICT) were examined, with the content of football and the perceptions of the General Lyceum students regarding their cooperation with students with special educational needs or disabilities. Two groups were created (the first with students attending General Lyceum (GE.L.) and the second with students from the Laboratory of Special Vocational Education, E.E.E.EK.), which collaborated (constructions - learning rules - race training) to compete in the WeDo 2.0 football pilot category. During their collaboration they used ICT, such as the Scratch optical programming language, the App Inventor environment, improvised applications for Android devices, the open source HotPotatoes software and Google Forms.

Keywords: Technology, Robotics, Adapted Physical Education

1. Introduction: Opera into Classroom

The use of technology in the field of special education and physical education is an innovative method for the development and enhancement of students' skills (Matzouratos et al., 2017). Robotics and its application in the learning process as an educational tool, presupposes cooperation, instructions' following, alternating roles, maintaining attention and concentration, combining entertainment through enjoyable activities. In addition, it enhances the social interaction and the development of the social skills of those involved (Karkani, 2017). Educational robotics has been applied in recent years in E.E.E.EK. Kilkis, with positive effects on students. It is an enjoyable and entertaining activity that allows them -under visual guidance- to be active and construct "live" projects according to their interests and with an adjusted degree of difficulty. Learning is supported by the constructivist approach according to which learning comes as a result of synthesis of new experiences which are supported by the exploratory method of acquiring knowledge, through communication and interaction with others, in a given environment (Koliou, 2018). Gergen (1999) lends a cognitive approach to constructivism, arguing that reality is created by the individual's constant interaction with the outside world. The zone of impending development, according to Vygotsky (1978, p. 86), is reflected in special education and collaborative programs, through the cooperation and guidance of the most capable peers. The teacher's role is strengthened and the students can

cooperate effectively through his /her guidance especially when the learning includes real situations of everyday life and is interesting and meaningful for the participants. It essentially describes the creation of a student-centered environment as the classes should be, in a collaborative setting that teachers assist and support their students (Nicaise& Barnes, 1996). Student collaboration supports the learning process as a result of active interaction and exchange of experiences (Collaborative Learning, 2005). An important element for effective collaboration between members is when team members complement each other, and teams are created with members' abilities in mind (Jacobson & Xu, 2004). The exchange of views, the sharing of information, the reflection, the search and finding of solutions, the utilization of the skills of the members, the sharing of experiences, contribute to the acquisition of knowledge in an authentic learning environment that promotes the development of skills and consequently the autonomy of its members (Matsagouras, 2002). The central idea is reflected in the sentence "learn by making" (Papert, 2001), and shows how ICT can be integrated into the educational process (Ackermann, 2001).

The enhancement of the learning process and the interest that develops in the lesson, gave the impetus to apply it as the content of an inclusive education program, in a collaboration of schools with an unprecedented pedagogical value. The impetus arose on the one hand from the widespread impact of the use of ICT as a learning tool (Fabiane, et al., 2012), the effort to utilize robotics in the lesson of adapted physical education with emphasis on rules, strategy and motivation for outdoors sports and on the other hand the desire to participate in a Panhellenic Student Competition (Glezou et al., 2010; Komis et al., 2012). The constructive conception of learning argues that the learning environment should provide authentic activities that are part of real-world problem-solving processes, encouraging expression and personal involvement in the learning process and social interaction.

The use of robotics helps to acquire knowledge and develop skills through an interdisciplinary approach, in a pleasant and entertaining environment, enhancing motivation for learning (Frangou&Grigoriadou, 2009).

The use of ICT in adapted physical education takes place in addition to the playful activities in the yard or in the gym. The low self-esteem and self-image that students in special education schools have about their ability and skills in sports activities have the effect of avoiding sports and participation in sports activities (Christiansen, et al. 2017). The physical education lesson is multidimensional and offers the framework to enhance and increase the level of self-esteem of students, as through the group play mainly students imitate social behaviors and learn the rules (Martlew, 2011; Bailey, et al., 2009). According to Kabatova&Pekarova (2010), the benefits of educational robotics are manifold; as it enhances students’ self-confidence and helps them develop their social skills.

In order for students with special educational needs or disabilities to be prepared to meet the requirements of the competition, it was decided to implement the inclusive education program, with content that is attractive to all participating students of both levels. It was decided that the students of GE.L. firstly get acquainted with the constructions related to WeDo football

and the software that gives life to the constructions, Scratch. Then, utilizing ICT (App Inventor 2 and creating knowledge quizzes), to help the students of E.E.E.EK. in learning the rules for football WeDo 2.0, their practice for understanding the game and the learning extension of rules in conventional football.

The program implemented and described in this article is a co-education program. Co-education or inclusion is the joint education of students with and without special educational needs in the general classroom (Soulis, 2008). In June 1994, ninety-two governments and twenty-five international organizations co-signed the Salamanca Declaration on "Principles, Policies and Practices in Special Education", which made clear the basic demand for inclusive education with respect and acceptance of diversity (UNESCO, 1994). In addition, the need to create new functional education systems became clear in order to avoid marginalization and non-acceptance of students in the common school context (Ainscow et al., 2011, Sebba&Ainscow, 1996). In May 2015, the World Education Forum in Incheon (Republic of Korea) reaffirmed the importance of inclusive and law-abiding education, as well as lifelong learning for all, expressing the need for continued efforts to eliminate all forms of exclusion and inequality in access, participation and learning. It was emphasized that a condition of inclusive education is the revision of the curricula, as well as the development of pedagogical practices that remove prejudices and meet the needs of all students with or without disabilities (www.isec2015lisbon.weebly.com). In recent decades, the global educational community has sought to integrate students with special educational needs, i.e. to harmonize them with all their classmates and to fully integrate into society through co-education or inclusion (Boutsouki, 2014).

New teaching models, such as collaborative teaching, are used to carry out inclusive education or inclusion. Collaborative teaching wants general and special education teachers to be jointly responsible for the organization, teaching, various activities, communication with parents or guardians, academic and behavioral support, educational evaluation for all students, with and without special educational needs (Walther-Thomas, 1997). Through collaborative teaching, general and special education teachers have the opportunity to share and exchange knowledge, both on the general curriculum and on special education issues. It is an opportunity for professional satisfaction and personal development (Sileo& Van Garderen, 2010).

Undoubtedly, the cooperation of general and special education teachers is not reported, nor is it limited to the boundaries of the classroom. In addition to co-teaching in the same room, general and special education teachers take part in meetings aimed at improving the cognitive, behavioral or other skills of their students, make joint efforts to improve the school infrastructure, the school environment, but also to promote the school in the local and wider community, through collaborations with municipal bodies, educational programs, cultural events, etc. (Harris, 2012).

It is an authentic learning environment and authentic learning in real conditions, followed by the consequent "authentic evaluation". Authentic evaluation is concerned with procedural

knowledge, not declarative knowledge, that is, knowledge retrieval. Students are called to understand in depth and not to memorize (Kasimati, 2014). Authentic assessment is the responsibility of teachers and students and aims to assess knowledge and skills to utilize the knowledge provided in always authentic conditions (Kouloumbaritsi&Matsagouras, 2004).

All of the above contain and cultivate skills that students need to develop today in order to be able to respond successfully to today's society and the subsequent labor market:

(a) Innovation and Creativity

(b) Critical thinking- Problem solving-Decision making

(c) Metacognition (learn how to learn)

(d) Communication

(e) Cooperation

(f) Information Literacy

(g) Technological Literacy

(h) Citizenship

(i) Career and Life

(j) Personal and Social Responsibility (Petropoulou, Kasimati&Retalis, 2015, p. 21)

Furthermore, the application of robotics in the educational process has been used as an educational tool that combines playing and learning in students with special educational needs or disabilities. It has also been reported that it strengthens the emotional field of students and in particular positive effects have been recorded in students' self-esteem and self-confidence, as well as in social interaction by enhancing their social and communication skills (Parker, 2005). The application of robotics in the field of special education is an education that combines playing and learning, in an entertaining context (Nikou &Fahantidis, 2016).

2. Educational planning

The educational planning was structured according to the learning objectives. Initially it involved the creation of a structure that would be in line with the skills and the pre-existing knowledge of students with special educational needs or disabilities. The technological literacy of the participating students, the needs of the students, the individual objectives depending on the final purpose of the program were taken into account, the appropriate teaching methods were selected (video presentation, discussion, simulation, teaching games, collaborative learning, discovery, solving problem and experiential learning). Essentially there was a combination of application of teaching methods depending on the stage at which each group was.

The final stage of the design included the evaluation of the program, which included the collection of information from the participating students. Evaluation is an important part of any educational planning that provides useful information that contributes to the evaluation of

the process, identifying weaknesses, problems, progress and achievement or not of the individual objectives and the purpose of the program.

The program was attended by 12 students of the 1st grade of the 1st GE.L. Kilkis and 8 students of E.E.E.EK Kilkis. The participants were divided into 4 groups, with each group consisting of 5 people. The program lasted 12 weeks and each week there was a two-hour course. The students of both school units received the equipment of Lego WeDo 2.0 in order to prepare to play at the Lego WeDo 2.0 football category. In addition, the students of GE.L. used additional applications and specifically, the application App Inventor 2, in order to teach the students of E.E.E.EK Kilkis the rules of the game in a playful and entertaining way, the collaborative documents Google Forms, as well as HotPotatoes software, for student assessment.

Lego WeDo 2.0 is the new, upgraded proposal of LEGO which gives new possibilities and is recommended for the introduction of robotics to children of the first grades of primary school, as well as in students with special educational needs or disabilities. The package combines the favourite LEGO bricks with an engine, two sensors and a controller that connects the model to the computer. It has simple drag-and-drop visual programming software that enlivens any construction due to the interactive features of this tool package. With this student-friendly approach, the package makes learning fun, enhancing inspiration and team spirit. Children come into contact with complex topics in the fields of physics, engineering and programming. Moreover, they develop their motion and cognitive skills by building simple robots and having fun with LEGO bricks. The connection of the robot with the Scratch 2.0 programming software to the computer is done through the Smart Hub and the bluethooth device.

Scratch is a visual programming tool commonly used for educational purposes. Scratch 2.0 is recommended for Lego WeDo 2.0 and is now only available as an application installed locally on a computer. Users can use it to create games, animations or interactive designs. Programming in Scratch is done by joining coloured blocks that each correspond to a programming command. Users join these blocks intuitively and control which connections work - like when building with LEGO bricks. Thanks to this method, simple programs are created in a simple and easy way and each program becomes an inspiration for the next.

App Inventor is a new, free visual programming environment with blocks, for creating applications for smart devices, mobile phones or tablets, with Android Operating System. The App Inventor environment has many similarities to the Scratch environment. The classic structure of the App Inventor environment consists of: (a) the Designer, where the user selects the components for the application he / she develops, and (b) the Blocks Editor, where the user visually combines the blocks of the program, to define the behaviour of the parts of the application (looks like assembling a puzzle). The tiles are sorted into different colours depending on the function they perform. The App Inventor is easy to learn due to its playful form and is available in the curriculum of the 1st grade of GE.L. When the user completes his /her own application he /she can either "package" it, to produce the final program in .apk (Android application package) format, in order to install it on an Android device, or even

distribute it for free or commercially to Google Play. Alternatively, if an Android device is not available, the user has the ability to create and control the operation of his /her own application, using the Android Emulator, which is software that runs locally on a computer and behaves like a mobile phone.

For the first three weeks, each group operated independently. The students of both schools came in contact with the components and got acquainted with the LEGO WeDo 2.0 equipment. They saw photos of the final constructions which were relative with their capabilities in terms of the level of understanding of the operation, the expediency and the time of its completion. They watched videos on how to connect the components, got to know the mechanical parts and practiced with small constructions. They then proceeded to build the robots with LEGO bricks, GoalKeeper (Figure 1) and GoalKicker (Figure 2), as well as their connection to computers, WeDo 2.0 software and Scratch 2.0 software (Nikolos et al., 2011). The groups worked in the computer labs of the schools, which were large rooms with the respectively designed places so that the cooperation of the members could be developed, an element necessary for cognitive development (Savery& Duffy, 1995).

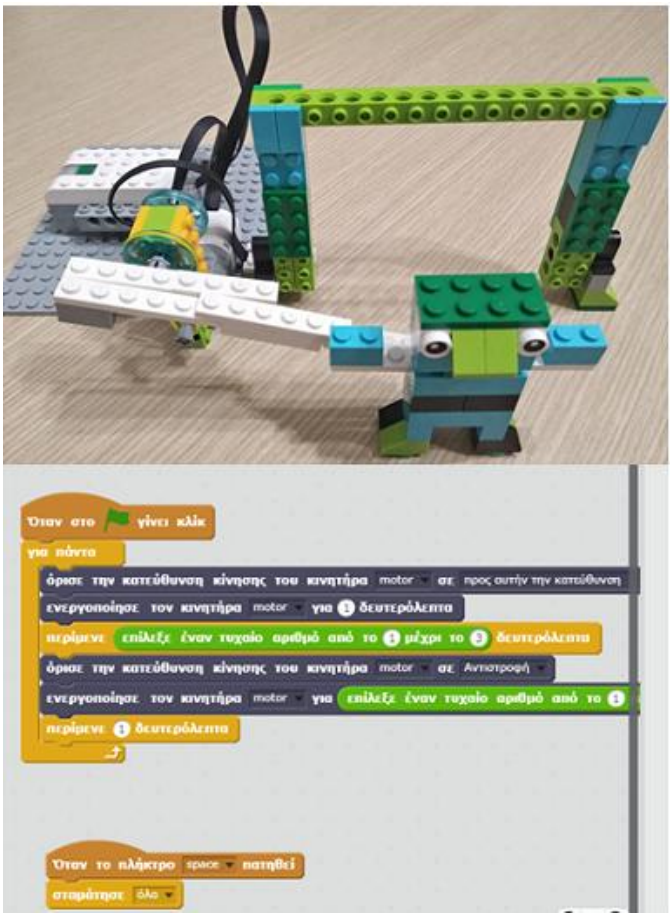

Figure 1. GoalKeeper and its code in Scratch.

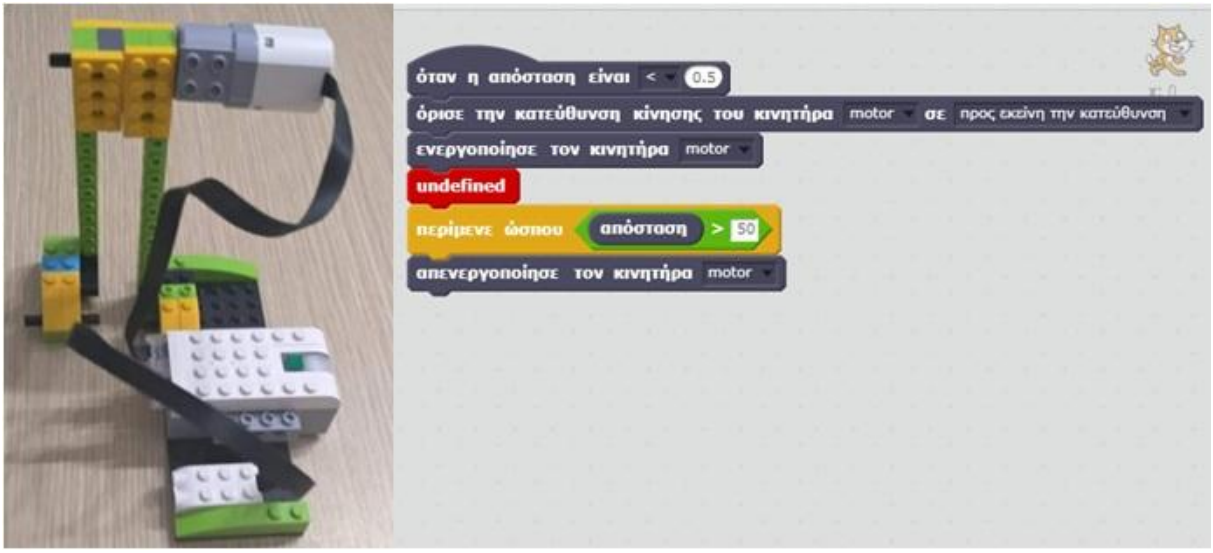

Figure 2. GoalKicker and its code in Scratch.

The team of GE.L. in the 4th week, was informed about the regulations that apply to Lego WeDo 2.0 football. In Week 5, they created the mobile phone knowledge quiz with learning questions about the rules of Lego WeDo 2.0 football and conventional football (Figure 3).

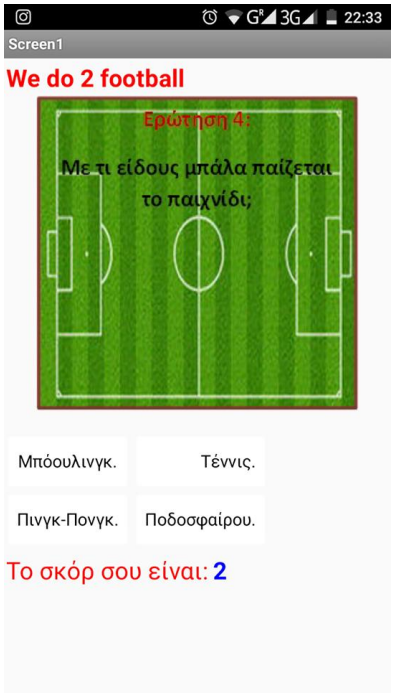

Figure 3. Screenshot from the quiz on mobile phone.

In the 6th week, they created, using Google Forms and HotPotatoes, the evaluation questions of the overall teaching scenario (Vernadakis et al., 2012). The students of E.E.E.EK. in the same period of time, got acquainted with the Lego WeDo 2.0 program, prepared their constructions and put them into operation. They first received the equipment, explored its components and then saw on video how they can proceed with constructions according to

WeDo themes, but also at their own free choice. We proceeded to present the purpose of the program and discussed and analyzed how it could be achieved. Then we experimented to learn how to utilize the building blocks of WeDo, by creating random constructions. The engagement led to the creation of questions and the need to provide assistance, which highlighted the importance of inclusive education, as concerns were raised which we posed to the students of typical development. In a climate of creativity, the students proceeded to the completion of constructions and recorded important questions that arose for them, which they would ask at the meeting of the group members.

The following weeks were divided as follows: 7th and 8th week, there was an acquaintance of the two groups and cooperation together for the creation of the constructions (Patrinopoulos, 2017) and solving questions or concerns about the constructions. Specifically, during acquaintance of the students / members of the two groups, the purpose of the program was discussed, the framework and the methodology that would follow to complete the program were defined. In the 9th and 10th week, the learning of the rules of the game followed (acquaintance and familiarity with the software and how to answer the questions). In the last 2 weeks the students were divided into 4 groups, trained with the constructions they prepared and followed a day where the students were evaluated.

Before the start of the inclusive training program, it was decided to carry out an initial and final evaluation. The GE.L. students answered an improvised questionnaire, structured in 4 different axes (emotions, cooperation, integration, friendship), with 4 choice options (no, probably no, probably yes, yes), which was implemented and distributed electronically (https: //docs.google.com/forms/d/1ehRyR2QmyZEmkfYSJghq70bt7hUjDtyYdsz1xFhMsGs/edit).

The students of E.E.E.EK., completed the axes of the questionnaire related to cooperation and friendship and additionally another questionnaire of internal motivation, which was created with the HotPotatoes application, and includes 3 factors: a) perceptual ability, b) interest / pleasure and c) effort / importance and two possible answers (yes and no) (Vernadakis et al., 2012). The questionnaires were created in the aforementioned applications by the students of GE.L.

The most common and easy-to-use tool used to create online questionnaires was Google Forms. To create it, all you need is a Google Account and a link to https://forms.google.com. The forms are available for sharing via email, a direct link or a social network for third party participation. They are part of Google's web application tool suite and are easy to use, as any user with medium digital skills can create forms and develop and use them. They can be accessed through various devices and are integrated into Google Sheets, resulting in the creation of spreadsheets with the data collected, making them easy to analyze. Disadvantages include limited design and the need for a Gmail account to be used.

At the same time, HotPotatoes was used, an open source software program that is freely available for non-commercial educational purposes and provided that the exercises created with it are freely available on the internet. Hotpotatoes consists of 5 sub-programs: JQUIZ,

JMIX, JCROSS, JMATCH and JCLOZE, which produce types of exercises respectively: short answer, jumbled sentences, crossword puzzle, matching and filling in blank words. There is also JMASHER software that creates larger, interconnected modules. All exercises are in the form of html web pages. They are actually java scripts that are created in a very friendly way, without the need for the user to know these programming languages.

3. Results

No technique by definition guarantees the success and effectiveness of the educational process. The effectiveness of each varies depending on the case (Reppa-Athanasoula&Ioannou, 2008). The present technique contributed to the maximum possible participation of students of typical learning and special education.

The evaluation of the action and in general the effort of the group of students was based on information for the achievement of the predetermined criteria-objectives such as: a) the presence - behavior of the group in place, b) the construction of robots, c) the kinaesthetic behavior of the robots on the maquette, d) the analysis and presentation of the program code and e) the presentation of the project.

Throughout this experiential work, a form of systematic observation was followed by the responsible teachers as an informal assessment. In this case, the assessors collect information about the students' performance in the classroom, without specifying the test conditions as in the formal assessment. Informal evaluation is often called continuous evaluation because it takes place over a period of time (Tsangari, 2011). Informal evaluation is done indirectly and the evaluated do not consider or do not understand how they are evaluated. Informal assessment tools are the observation, the diary, unscheduled comments, written or oral tests of graded difficulty, performance of tasks by students in groups, interviews, anecdotal notes, keeping a student portfolio.

All of the above were used and the participating students showed a special interest in technology and robotics, increased emotional and social skills, acted responsibly, showed more interest, gained motivation and became more actively involved in the educational process. They learned to talk and converse, as well as to work in groups. Especially in introverted students, the extroversion was developed and the self-confidence and self-esteem of students with special needs, learning difficulties and difficulties of integration in the school environment were strengthened. They realized that differences between students are positive sources for developing their adaptability and mutual respect, changing their attitude both in school and in society (DanochristouKairis, 2014).

Two improvised questionnaires were created to record the perceptions regarding the co-education for the students of GE.L. and for the students of E.E.E.EK. As the results showed, positive effects were recorded in terms of emotions, cooperation, friendship and integration.

According to the qualitative and quantitative evaluation, there were significant differences in the perceptions of the students of the two schools in all axes.

The students of E.E.E.EK., as it emerged from their answers, strengthened the feeling of

"cooperation", as their initial doubts were overcome at the end of the program. The important element that emerged was the change observed in their responses to the axis of "friendship". It was found that the program helped them feel that they had made friends with whom they could share common moments and participate in activities, inside and outside the school. In the internal motivation questionnaire there were positive changes in all three axes.

Corresponding results are recorded in all four axes for the students of GE.L. The feeling of sadness expressed in the axis of emotions, was eliminated after the end of the program. In the axis that refers to the collaboration, the initially skeptical perceptions of the students regarding the level of the collaboration were overcome through the personal experience. There was also a shift in the answers to the questions of the axes of integration and friendship, where their initially negative perceptions turned into positive ones.

Both schools and the wider community benefited, as the results of the program were disseminated to the wider school community during the student competition events that took place.

The present study transcends traditional teaching and is part of modern educational practices that highlights the positive implications that can occur in the perceptions of students of typical development, by the application of robotics and the use of ICT, in the educational process, in level of inclusive education. It also reveals how robotics can be combined in adapted physical education and in the field of special education in general. However, the small number of participants, the short duration and the improvised evaluation, make the interpretation of the results limited.

4. Conclusions

The present experiential work recorded the effects that can be observed in students of typical development and students with special educational needs or disability, through the implementation of a program of robotics and inclusive education.

The application of recreational educational robotics in special education is a valuable educational tool that can enhance students' skills (Gura, 2007). The immediacy of the experience, the experiment, the creativity, but also the active participation and self-action are parameters of great importance in the education of children with special needs.

Robotics, on the one hand, is an entertaining and interesting activity that enables students to engage in action, on the other hand, it can be used at all levels of education to teach various concepts, even subjects such as the Physical Education course (Matzouratos et al., 2017, Karkani, 2017). As mentioned by Papert (1991), when students are actively involved in activities that involve the design and construction of real objects that make sense to them, they construct knowledge effectively. WeDo 2.0 provides students with the ability to understand the relationship between commands and motion by visualizing the execution of "live" construction, enhancing motivation for learning but also linking theory to practice and performing activities in their daily lives. An important element is the immediate feedback provided during construction, as any mistake does not allow the program to work properly

and effectively (Barnes, 2002)

Educational robotics has positive effects not only in the cognitive field but also in the emotional (self-esteem, self-confidence) and social (socialization, demystification). The aforementioned effects are enhanced through collaboration and co-education, between students with common goals, different characteristics and needs.

The use of ICT can be auxiliary through various applications such as mobile knowledge games, open and free visual programming environments (Scratch and App Inventor), collaborative documents (Google Forms) and highly user-friendly software exercises (Hotpotatoes), to change perceptions and attitudes towards the abilities of students with disabilities and to enhance the self-esteem and self-confidence of the participants.

From this brief contact with the specific issues, the importance of authentic learning and evaluation has emerged. An authentic learning and assessment framework is necessary to "equip" students with all those necessary skills for their future, life and career.

The main goal of education in today 's Learning Society is not only the teaching of useful and necessary knowledge in every subject, but mainly the development and cultivation of strong cognitive, metacognitive, social and communication skills (21st Century Skills), which will allow each learner to become an independently thinking and active citizen of the 21st century.

Undoubtedly, the didactic proposal is not effective in all cases and thematic areas. Frey (1998: 73-83), for example, emphasizes that this method is not appropriate when the goal of teaching is to learn a strictly structured material. It is enough to consider the Greek educational system, that in high school classes students prepare for the national exams and we will find that the application of this method is rather impossible. Of course, in courses that are not examined nationwide, teachers can more easily adopt such methods and lead the class to more creative activities. In addition, the project method is not appropriate, when students should be taught a specific subject in a short period of time that the performance of students should be evident after the end of the learning process (Fotiou&Soulioti, 2006).

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