Giornale Italiano di Educazione alla Salute, Sport e Didattica Inclusiva / Italian Journal of Health Education, Sports and Inclusive Didactics - Anno 6 n. 1 - ISSN 2532-3296 ISBN 978-88-6022-436-1 - gennaio - marzo 2022 - CC BY-NC-ND 3.0 IT-
https://doi.org/10.32043/gsd.v6i1.573

THE DIGITAL PROJECT "A TU PER TU" AS AN EDUCATIONAL TOOL FOR INCLUSIVITY AT THE UNIVERSITY

IL PROGETTO DIGITALE "A TU PER TU" COME STRUMENTO EDUCATIVO INCLUSIVO ALL'UNIVERSITÀ

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Abstract

Inclusive Pedagogy and Didactics solicit deep reflections and rethinking, in an innovative perspective, about new languages, tools and ideas to meet the differences and diversities of each person. The interdisciplinary working group made up of engineers, pedagogists, sociologists and psychologists from the University of Tuscia has given rise to the experimental digital project "A TU per TU", which aims at 1. encourage the active participation of all students; 2. stem possible forms of discrimination and exclusion; 3. build truly inclusive learning environments; and 4. ensure the educational success of all university students. The project, aimed at implementing digital tools, support actions and best practices specific to each student, exploits on-the-edge technologies as virtual and augmented reality (VR-AR) and artificial intelligence (AI). Particular attention is paid to psychosocial aspects, students with special educational needs and training of support tutors. "A TU per TU" perfectly suits the fundamental principles of Special Pedagogy, with which it shares approaches and intentions. In this paper we present the main contents of the project actions, as a proof of concept of what will be done.

Abstract

La Pedagogia e la Didattica inclusiva sollecitano profonde riflessioni e ripensamenti, in prospettiva innovativa, in merito a nuovi linguaggi, strumenti e idee per andare incontro alle differenze e alle diversità di ogni persona. Il gruppo di lavoro interdisciplinare composto da ingegneri, pedagogisti, sociologi e psicologi dell'Università della Tuscia ha dato vita al progetto digitale sperimentale "A TU per TU" (*Apprendimento TUscia per TUtti*), che si propone di: 1. favorire la partecipazione attiva di tutti gli studenti; 2. arginare possibili forme di discriminazione ed esclusione; 3. costruire ambienti di apprendimento realmente inclusivi e 4. garantire il successo formativo di tutti gli studenti universitari. Il progetto, finalizzato all'implementazione di strumenti digitali, azioni di supporto e buone pratiche specifiche per gli studenti, fa uso di tecnologie molto innovative, quali la realtà virtuale e aumentata e l'intelligenza artificiale. Particolare attenzione è rivolta agli aspetti psicosociali, alle necessitàformative degli studenti con bisogni educativi speciali e alla formazione di tutor di supporto. "A TU per TU" si integra felicemente con i principi fondamentali della Pedagogia Speciale, con cui condivide approcci e intenzioni. Nel presente contributo vengono presentati i contenuti salienti delle azioni progettuali ideate, attualmente in fase iniziale.

Key-words
university, inclusion, special educational needs, artificial intelligence, virtual reality

università, inclusione, bisogni educativi speciali, intelligenza artificiale, realtà virtuale

Introduction

In the last decades, italian policies have promoted numerous democratic norms and laws (L. 517/77, L. 104/92, L. 17/99, L. 170/10, D.M. 27/12/12, C.M. 8/3/13, L. 107/15, D.lgs 66/17 and D.lgs 96/19) conducting relevant project actions and creating interesting observatories aimed at supporting, with incisiveness, the inclusive cultural perspective in the school and social contexts (Ianes & Canevaro, 2018).

«With the approval of Law no. 17/99, a new season was inaugurated in our country based on a more systematic approach to inclusion policies for university students with disabilities/DSA, whereas in the past there had been sporadic interventions, prompted by individual cases. In the last two decades, the academic institution has been active in guaranteeing, from an increasingly inclusive point of view,

support for the attendance of study courses - at first aimed exclusively at young people with disabilities, later also at those with specific learning disorders. In particular, each university is committed to ensuring specific services, individualised treatment during lessons and for passing exams, as well as innovative teaching, both through its own planning, organisational and teaching structures and through dedicated ministerial funds» (Pavone, 2019, p. 10).

Currently, the focus on the principle of equity, educational justice (OECD, 2018) and equal opportunities in education helps to provide resources, tools and aids that facilitate the achievement of concrete educational objectives in terms of knowledge, skills and abilities by each student. The current school and university context, inhabited by students with rapidly expanding "special educational needs" (SEN), necessarily calls for and invites institutions to acquire an open and pluralistic inclusive perspective, able to read the needs and emergencies present in educational contexts, following a highly flexible and constantly evolving dynamic logic. In striving to develop the wellbeing of students, with and without special needs, through the creation of inclusive and facilitating contexts, the University is oriented towards guaranteeing each of them the full realization of the right to study, despite the presence of vulnerabilities and fragility (Canevaro, 2015). In order to achieve this objective, the university institutions are interested in producing critical reflections and insights with respect to the adoption of quality design models and the effectiveness of the teaching strategies used to reduce barriers to learning and participation in community life (ICF, 2004; Mura, 2014). The training commitment of national universities is directed towards

«guaranteeing students the acquisition of those capabilities that are functional for full integration in the world of work and in the contexts of associated life. Active citizenship, in its highest and most complete sense, implies in fact the development of specific skills necessary for conscious, critical and responsible participation in the life of the community. The involvement of students in authentic university experiences is indispensable and becomes a key prerequisite, more than academic study alone, for the promotion of individual and collective agency, in that it ensures that the rules and principles of democracy are directly experienced» (Bellacicco, 2018, pp. 186-187).

The lively debate on the issue of the desirable and necessary change in the academic community, which has taken place over the last decade, has inspired a positive implementation of policies to strengthen and innovate inclusive practices. In this perspective, Italian universities have set up services, listening and support spaces for students with SEN, taking care of their learning difficulties and their complex and different problems (Arcangeli, Sannipoli, 2020) by adopting personalised, individualised (Baldacci, 2006) and differentiated intervention strategies (d'Alonzo, 2019) accompanied by compensatory tools and dispensatory measures. Despite this, recent Italian research, conducted in the field of Special Pedagogy (Bellacicco, 2018; Pace, Pavone, 2018; Pavone et al., 2019; Antonietti et. al. 2020; Bocci et al., 2020), argues that the presence of students with SEN still represents a significant challenge for the Italian academic system. In this perspective, the project "A TU per TU" (*Apprendimento TUscia per Tutti*) promoted by the University of Tuscia, and financed by Ministero dell'Istruzione (Miur) in relation to art. 11 of the ordinary financing fund (FFO), aims at creating an experimental centre where ad hoc digital tools will be designed and implemented for each student, in order to provide an effective support that could lastnot only the time of the academic career, but, in general, during the entire lifelong learning. These tools will originally be designed for students with SEN (Genovese et al., 2010), but will then be extended to be used by all, according to the perspective of *special normality* (Ianes, 2006) that enriches ordinary teaching with effective and special strategies oriented to the

recognition, enhancement and respect of differences and diversities. The implementation of innovative devices will be based on cutting-edge technologies such as artificial intelligence (AI) and virtual reality (VR). The former will be used to predict and test the individual needs of each student, in order to provide each one with the most suitable support material. Virtual reality, instead, will allow users to be more engaged during their studies, thanks to the fascination and involvement that virtual scenarios can arouse. "A TU per TU" project essentially refers to a complex vision of the human dimension that requires systemic inclusive interventions, capable of facilitating the participation and accessibility of each and everyone in educational contexts (Arcangeli et al., 2017). According to the inclusive logic of reasonable accommodation, introduced by the United Nations Convention on the Rights of Persons with Disabilities (2007) and implemented by Legislative Decree 96/19, it becomes necessary to implement a flexible didactic organization and action, capable of intercepting the differences and singularities of each student (Cottini, 2017) so that everyone can appropriately and legitimately access learning processes. The synergy and the virtuous dialogue between the perspective of Special Pedagogy and that of Artificial Intelligence contribute to the strengthening of tools and strategies in favour of full participation, real accessibility and university welfare of students with and without SEN (Montanari, 2020).

1. The inclusive digital project "A Tu per TU"

"A TU per TU" project, currently in its initial phase, aims at setting up an experimentation centre for services and learning environments in which cutting-edge digital technologies, such as AI (artificial intelligence) and VR/AR (virtual and augmented reality), contribute to the creation of innovative inclusive teaching methods for all students, especially those with SEN (Arcangeli, 2018). The project will make a further step towards the creation of new inclusive ways of teaching, using both traditional practices and the rich potential of new technologies in the best possible way. The key points of the project, which consists in specific and intentional tasks to be performed sequentially, are summarized below.

1. *Implementation of virtual and augmented reality scenarios for the assessment of psycho-social aspects of SEN students*

One of the most innovative aspects of the project "A TU per TU", is represented by the digitization of questionnaires and/or tests currently used in the field of psychology for the assessment of training needs of students with BES (Benedetti et al., 2022), with particular reference to the problems to be addressed during a university course, in order to customize their learning path. First of all, a bibliographic research will be carried out on the most commonly used tests and, subsequently, their possible digitisation and virtualisation for the final selection will be evaluated. These tests will make it possible to construct a profile of the state of the student with SEN and will be used, in the final phase, to evaluate the effects induced by the experimentation implemented by a pre-post-comparison. Subsequently, the tests will be implemented through the use of tools for virtual reality and augmented reality, both software and hardware (visors, helmets, etc. ...), according to the playful mode of the serious game that has the property of increasing user involvement using engaging scenarios.

2. *Implementation of virtual and augmented reality scenarios for the assessment of each student's learning needs.*

After, an initial analysis of the state of the art aimed at selecting the most appropriate tests on the one hand, and to develop new ones on the other, in order to achieve the goal, ad hoc study

methods for each student will be identified. The attempt is to allow the limitations of ordinary, standardised and homogeneous teaching to be overcome. As in the case of psycho-social tests, gamification of the tests will be carried out, i.e. the performance of the required task will be made attractive to the user through the use of game design elements and techniques in non-game contexts.

3. *Market analysis of useful tools for personalised teaching.*

Subsequently, a market analysis will be carried out to identify existing digital tools to support students with SEN during individual study activities. The tools to be searched will be indicated by the outcomes of the previous two points. Examples of possible support include:
- creation of concept maps from a text;
- replacement of words with synonyms that are easier to understand and/or read;
- vocal reproduction of the content of the text
- vocal synthesis of the content of the text;
- recreation of images in place of words that are difficult to read and/or understand;
- creation of hypertext and/or flowcharts;
- facilitating calculation tools;
- writing support;
- braille displays for blind people;
- VR and AR environments.

Both open source and proprietary software will be considered in order to identify the most effective tools to achieve the objectives. Wherever possible, the former will be selected to ensure greater usability for all. It should be emphasised that, in the experimental centre set up, the necessary devices will be made available to all students. Specifically, workstations equipped with tablets and headsets for the use of virtual and augmented reality will be used, allowing students with and without SEN to use the teaching methods most suited to them. The choice of the most suitable tools for different group of students will be made by integrating the information available from their clinical report with the results obtained in the tests described in the first two actions. An artificial intelligence algorithm, currently being developed by the Engineering research group of the University of Tuscia, as part of the European project VRAIlexia (Zingoni et al., 2021), will associate issues and needs of the students with SEN, to the most useful support tools.

4. *Optimisation and/or implementation of support tools.*

The aim of this action is to improve, or even create from zero, the tools identified in the previous intervention phase, so that they are personalized for each single student. Again, the predictive power of artificial intelligence will be exploited, in order to make the digital tools ad hoc for everyone.

5. *Pre-testing with SEN students.*

In the final stages of the project, preliminary tests will be carried out involving a limited number of students with SEN, who will be asked to use of the full potential of the testing centre (virtual/augmented reality tests and support tools) in order to verify the effects, both at educational level (passing exams, grades, study organisation, etc.) and at psycho-social level (self-esteem, motivation, skills, etc.). The information acquired in this phase, will be used to improve the developed digital tools and to make them more personalized.

6. *Establishment of a SEN-friendly tutor and training courses.*

This action is aimed at strengthening the university offices in charge of disability issues, which will participate in the research activity. In particular, they will receive training to both gain specific skills in supporting students with SEN, and use the developed digital tools. Professional figures called "SEN-friendly tutors" will be also trained and examined to acquire a specific certification. Their role will be to indicate to each teacher the most suitable personalised strategies for each student with SEN, to facilitate learning, as well as to provide the students with appropriate indications for the satisfactory completion of individual university courses. The SEN-friendly tutor will be able to support students with SEN and act as a contact person for the administrative management of the bureaucratic procedures necessary for enrolling and accompanying students on the various courses. The last phase of the project will be dedicated to the realisation of a training course for teachers and students on the correct use of the digital tools in the experimentation centre.

2. Special pedagogy and digital technologies: an open dialogue

The Project "A TU per TU" is part of the construction and enhancement of inclusive university paths that, in the perspective of complexity, are the result of the significant intertwining of interdisciplinary research between the human sciences (Special Pedagogy, Sociology, Psychology) and new digital technologies, such as AI, VR and AR. The project represents an innovative practice that makes use of both traditional intervention methods and the potential offered by new technologies (Pireddu, 2014, 2017), in view of the realization of a truly inclusive university able to care for all students by encouraging them to cultivate their self-advocacy skills (Garrison-Wade, 2012). The university institution can and should address a substantial support to people with SEN, allowing them participating and having equal opportunities, also in reference to the labor market, which presents obvious criticalities regarding the opportunities for occupational well-being, as evidenced by the phenomenon of the match/mismatch between the level of education acquired and that required to perform the profession (Bellacicco, 2020). The project "A TU per TU" is aimed at the creation of digital tools that can put into practice the renewal, revision and transformation of teaching methodologies and, consequently, of learning, putting in the foreground the different intelligences of each student (Gardner, 2013), no one excluded (Canevaro, 1999). Specifically, the creation and provision of effective, valid and concrete tools to help students with SEN oriented to counter any obstacles related to learning and participation in university contexts is the result of the contribution of Special Pedagogy, as a science of theoretical and practical research that welcomes the significant empirical contribution of new digital technologies for a real change in university policies. The tendency to conceive the "special educational needs" as a magnifying glass for the search of new, experimental and effective educational paths is the result of the shared planning between "A TU per TU" and Special Pedagogy. The inclusive synergy between the Special Pedagogy and AI, VR and AR, is directed in actively supporting, recognizing, valuing all differences and diversities. The adoption of a personalised, individualised and differentiated university didactics in response to the educational needs, special and not, of the students offers them innovative digital supports in compensatory and dispensatory key (generated by virtual and augmented reality) and human resources (SEN-friendly tutors) to guarantee the accessibility to learning for everyone. In addition, the strong commitment of the project "A TU per TU" in supporting the recognition and enhancement of differences and diversity in university contexts (Zecchi-Orlandini et al., 2016; Genovese & Guaraldi, 2020), through the adoption of personalised and differentiated teaching tools for students with SEN and non-SEN, is in line with the inclusive

perspective of Pedagogy and Special Education as disciplinary areas that are drivers and promoters of effective change (Bocci, 2021).

Conclusions

In order to take into account the different needs and all the necessary actions to ensure the reception, mediation and support for all students, the attention of Italian universities is directed towards the implementation of educational policies aimed at building an innovative, organised, monitored and effective teaching. To achieve this goal, all the necessary teaching strategies are put in place to ensure the accompaniment and monitoring of the effectiveness of the practices adopted, with particular regard to students with SEN and/or learning disorders, who need personalised adaptations within learning environments, which are respectful of participation and acquisition of skills, in the most active and autonomous way possible, to be used along their university path. The digital project presented here, whose results will be available within a year, is oriented to implement the educational approach centered on the student as an active and participatory protagonist of his learning and university education. The target of the project includes all students, both with SEN and not, to whom the project "A TU per TU" is addressed indiscriminately. The University of Tuscia is committed to fostering the quality of inclusive university processes and the improvement of learning, reducing, as a consequence, the decrease in the dropout of academic paths by university students who manifest special needs and/or specific learning disorders. This project idea exploits innovative technologies based on AI and VR/AR for the creation and implementation of digital tools to support teaching usable on PCs, tablets and smartphones and available to all students, with and without disorders and/or difficulties. The educational project "A TU per TU" is perfectly placed within the founding themes of Special Pedagogy, as it proposes the use of ad hoc didactic and operational tools that enhance the differences and diversities represented by all students, contributing to the quality of university planning and implementing a truly inclusive educational process.

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