

New Educational Model and Settings for social inclusion. A case study

Modelli educativi innovativi e contesti per l'inclusione sociale. Uno studio di caso

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This paper provides a discussion concerning the use of new technologies to favor teaching-learning processes in the University field, aimed at all students even with disabilities and with Specific Learning Disorders. Specifically, authors present educative strategies and pedagogical perspectives activated by Virtual Reality (VR) and Augmented Reality (AR). A significant path within the University of Macerata and the São Paulo State University will be pre-sented, as a relevant example of new technologies in support of inclusive practices

Key-words: assistive technologies; university students; disabilities; specific learning disorders; inclusion.

abstract

Esiti di ricerca e riflessione sulle pratiche

(A. ricerca qualitativa e quantitativa; B. progetti e buone pratiche; C. strumenti e metodologie)



1. Introduction

Assistive Technologies (ATs) represents the set of effective resources in our society, in which relationships, knowledge, and culture are increasingly going through the channels of digital communication. In all life contexts, technologies assume a role of crucial importance and consequently have an ever greater impact on the ways in which people, even with disabilities, live and interact with the world around them.

In detail, in accordance with the “U.S. Assistive Technology Act”, 2004 (Public Law 108-364, 2004, 118 STAT. 1709-1710), the term Assistive Technology refers to technology designed to be used as the practical application of knowledge (Encarnação, Cook, 2017). ATs are, therefore, any hardware and software instruments that allow conversion of information, not available to the user, from a format to another, accessible, one (the Braille bar, voice synthesis, voice recognition), or offer a mode of use of the devices with an input suited to the needs of the person (special computer mice, special keyboards, on-screen text magnifiers), in order to use, improve or maintain the skills of individuals with disabilities (Bryant *et al.*, 2010; Reichle *et al.*, 2011).

In this direction, it seems necessary to clarify what are some of the fundamental prerequisites for the appropriate use of any form of ATs. First, the technological tools must correspond to the needs of the people for whom they are used, in other words, it must be adaptable to the characteristics and abilities of the person and correspond to the needs of their living environments (Bauer *et al.*, 2011; Borg *et al.*, 2011; Burne *et al.*, 2011). A second principle is that the technology is used as a part of an explicit and carefully designed intervention program, in order to make its use as effective as possible (Lancioni, Singh, 2014). Taking these assumptions into consideration allows a conscious and more significant use of ATs also in educational contexts, in which the set of instruments and technical solutions can also allow the person with disabilities to have opportunities for greater accessibility (Brown *et al.*, 2009; Reichle, 2011; Shih, 2011).

These considerations have prompted our research towards the analysis of how the technological potentials were capable to support the educational contexts of higher education, specifically Universities. The primary objective of this research is, therefore, to investigate how innovative technological forms can allow greater levels of accessibility and usability in University, which today are open to people with disabilities.

2. Technologies at the University: pedagogical strategies for students with disabilities

The main objective of the use of new technologies within the pedagogical field for students with disabilities and special needs is precisely to promote equity in education and training opportunities (Giaconi *et al.*, 2019). ATs offer enormous opportunities for the effective realization of an inclusive educational and social context that promotes the full participation of all students in learning and classroom life while respecting diversity, different needs and abilities, characteristics and student learning expectations. In this direction, new technologies are the keystones of an effec-



tive educational process: on one side, thanks to the new ATs students with disabilities can develop a more active role in the school and/or university, increasing their involvement in learning and develop a consequent autonomy (Giaconi *et al.*, 2018); and, on the other side, ATs are able to remove all obstacles to participation because learning takes place through a different structuring of the teaching environment, towards the full use of new technologies and the use of technological aid, that can guarantee greater accessibility of information (Giaconi *et al.*, 2018).

Specifically, if we focus our attention on the possibilities offered by technology within university contexts, technologies could be useful in the process of «supporting students' organization of academic work and general ability to manage academic demands» (Henderson *et al.*, 2017, p. 1576). A wide range of research shows that ATs can become an integral aspect of the University student career (Henderson *et al.*, 2017; Capellini *et al.*, 2018; de Anna, Covelli, 2018; Giaconi *et al.*, 2018). For example, the flexibility that characterizes technologies allow the correct identification of the most appropriate tool for personal characteristics, «in accordance with the tasks to be performed, the context and the degree of acceptability tolerated by the user» (Giaconi *et al.*, 2018, p. 198). Personalized, adaptive and suitable tools can allow the activation of educational processes, affecting the styles and rhythms of learning of each student (Besio, 2005, p. 142). The plurality of communication channels can make it possible to act, manage and shape materials and contents in relation to one's personal needs. Even more, technologies, allowing differentiated educational performances for students who present special needs, implement relational and emotional approaches to knowledge, encouraging metacognitive processes that allow them to increase their knowledge levels. The interactive nature of technological devices, with input suited to the person's needs, represents one turning point in achieving the learning process. Because hardware and software instruments integrate texts, images, audio and videos, students can use technological resources interactively, benefiting from a series of stimuli, keeping them involved during their learning time (Capellini *et al.*, 2018).

Taking into consideration the ATs to be addressed to University students with disabilities, our investigation is narrowed down, specifically, on Virtual Reality (VR) and Augmented Reality (AR), since these types of realities, introduced in teaching/learning academic settings, are able to transform the experience of fruition into an immersive perspective, a media space in which the person experiencing it is projected.

Aylett and Louchart (2003) affirm that AR and VR assume the connotation of a mediator (*medium*), whose main characteristics are contingency, presence, interactivity and narrative form. The authors state that by contingency «the space-time distance of the narrative is contingent on real-time; by the presence, how much the spectator/user space-time is shared in the narrative (immersion); by interactivity, to what extent do they interact with the narrative process and by narrative representation the characteristic form of the narrative used in the mediator (medium)» (Aylett, Louchart, 2003, p. 3). Furthermore, Aylett and Louchart make a distinction, according to the narrative medium, between “spectator” and “user”: «a user does not contemplate or watch a narrative display as a spectator does» (*Ibidem*, p. 3). By “spectator”, Aylett and Louchart (2003) mean the passive role of the person, that is, the one who observes without having direct involvement in the surrounding situation. The term “user” refers, instead, to whom the narrative is directed. The “user”, in fact, acquires a central role of the protagonist within the virtual environ-



ment, the one who makes his/her own choices, taking advantage of all the experiences available.

The educational potential of VR and AR is substantiated in this crucial differentiation of perspective, in which the person that is a “user”, even with disabilities, activates his/her own learning modalities through a complex sensorial and affective interaction. In these virtual environments, recreated for specific purposes, students, supported by a specialized operator or educator, can train their cognitive skills. Within a dynamic and emotionally engaging environment, where the person acts directly with both real and virtual objects, he/she can take advantage of his/her training in a “cognitively” useful scenario (Invitto, 2013).

In educative contexts the use and the correlated positive aspects of VR and AR are plurals. Among them, for example, communication skills can be increased, thanks to the use of interactive systems. The person, even with disabilities, can communicate through a monitor, showing specific intentions, needs, doubts, etc. In this direction, we think about the administration of questionnaires addressed to people with intellectual disabilities where questions are formulated with the Yes/No alternative, in which thanks to the use of VR and AR multimodal practices can be created for the purpose of making the Boolean answer accessible (yes/no, true/false). Dunn et al. (2006) carrying out a study on the use of video materials to ensure accessible information in order to provide psychological services, they say that if the information is structured, it can be learned better and also more: «[...] information was understood and maintained more efficiently when the video was presented and understanding assessed in three separate chunks of information rather than a single one» (Dunn *et al.*, 2006, p. 34). In the vast panorama of personal devices, such as smartphones and tablets, further strength can be found in the digital experiences of AR and VR. Used alone or with the help of connected wireless devices, such as viewers or dedicated applications (Apps), AR and VR can help to return the information created *ad hoc* for any user. In this sense, the relationship that exists between the one who creates the content and the one who benefits from information, through interaction and feedback can both actively participates in the building of the resulting experience. AR and VR modify the areas of didactic planning and realization, which allow a constant dialogue with the stakeholders of knowledge and the users to whom they turn, allowing for mutual and widespread training.

These considerations permit the contemporary educational structure to approach VR and AR in the creation of educational processes which, thanks to vehicles such as videos and images, and in addition to different quality levels of interaction, can allow the creation of deep and involving practices, within specifics contents and directed for specific personal characteristics (Kavanagh *et al.*, 2017; Caldarelli, 2018; Beck, 2019).

3. AR and VR in the University educational contexts: an example beyond teaching

As previously revealed, the virtualization of environments allows people to have different solutions to activate the learning processes even for those with a disability.

In line with what emerged previously, we report a study carried out with University students with disabilities at the Department of Education, Cultural Heritage and



Tourism at the University of Macerata, had the aim of making accessible not only content academics but also University surroundings through AR and VR.

The same protocol of research is about to be carried out at the LIDA research laboratory, at the São Paulo State University where the data will be collected and analysed as in the following way.

The case study that we have conducted is part of a larger investigation that has seen the involvement of the entire student population with disabilities. Through a structured questionnaire, an attempt was made to investigate the level of satisfaction of students with disabilities regarding the accessibility of both the disciplinary contents and the physical space of the different departments of the University.

Out of an estimated population of about two hundred students with disabilities enrolled at the University of Macerata, forty-four students with disabilities decided to answer the questionnaire. Among them, sixty percent returned a good level of satisfaction with reference to the accessibility of the University of Macerata; the remaining forty percent reported a low level of satisfaction. From the data analysis, we found that this percentage corresponded to students with Autism Spectrum Disorders. Therefore, it was decided to proceed with a structured interview to understand the reasons underlying the low level of satisfaction of this target, with reference to the accessibility of the University of Macerata. Among the group of University students with Autism Spectrum Disorder who answered the questionnaire, we chose the five students enrolled in the last year of the three-year courses of our University. From the analysis of the interviews (transcribed and analyzed in the written text), to emerge with greater preponderance, so as to be considered as the “core category” of the study, was the lack of tools capable of making University environments accessible (student secretariat, classrooms, libraries, technological laboratories, etc.). For this reason, in relation to the responses of these students, the University of Macerata would appear to be hardly accessible in reference to their need for anticipation and predictability. Students clarify that before accessing academic content, they consider strong necessary to be able to enjoy the spaces and environments in which University life takes place in a more interactive and engaging way. From the survey, therefore, we went on to carry out a co-design of accessible formats also for students with Autism Spectrum Disorder. The outcome of the co-design has seen the creation of a virtual path of different University environments (technological workstations, libraries, classrooms) through the combination of digital photographic formats (commonly known as “spherical photos”) and AR and VR, that can be used by any personal device.

The results of this research have also led to the choice of creating the elaborate prototype, which will be developed and generalized for the virtual mapping of the various Macerata University offices that are of high interest for the student community.

According to the results founded, accessibility, cultural participation, and the sharing of community living spaces appear to be one of the most important points in lifelong learning (Giacconi, Del Bianco, 2018). The direct involvement of the stakeholders through the co-planning activity demonstrates excellent potential not only with regard to the creation of inclusive environments but also in terms of the acquisition of «metacognitive, methodological and training skills that [students] able to manage their expectations/potential/constraints regarding adult trajectories of independent life» (Pace, Pavone, Petrini, 2018, p. 292).



4. Conclusions and pedagogical reflections

The use of technology within the University field, as underlined in this paper, could be meaningful for students with disabilities. Despite the positive aspects that emerged in our reflection, some challenges remain open.

In this work, our attention has been directed towards AR and VR for the affordability of the paper, but the plurality of technological proposals that can be activated in educational contexts, including Universities, are various and may even lead to confusion for the most appropriate choice of the specific user. For these reasons, we consider further research calibrated to the possibilities that technology can offer in relation to the realization of a system adaptable for each student (Giaconi, Del Bianco, 2018). The challenge of technologies in the educational sector, in particular, but in the economic market in general, lies in the trend of a necessary centrality and diversification of users: «Technology that cannot satisfy the needs or expectations of the user will not be useful for improving the quality of his/her life» (Monteriù, 2018, p. 38).

The diversification is also combined with the economic sustainability of the aid. In some cases, the use of technologically advanced and particularly excellent software and Apps require payment and the costs are not always moderate, with the result that currently many of the Assistive Technology is the prerogative of a few: the real challenge is to reverse this trend. In addition, Assistive Technologies cannot and must not be traced back to mere economic value, but rather to their enormous value which they represent in increasing the Quality of Life of people with disabilities (Giaconi, 2015).

Finally, the substantial area of development and implementation of technological products drives us to reflect on the missing data concerning students' personal perceptions in relation to their use of technology in the academic world for learning purposes. Future research could explore the effects of technology in learning principles, to understand better the use of technology in higher education thanks to rigorous empirical studies. The pilot project that we presented in this paper allowed us to collect the voice of students with disabilities in the desire to reach a co-design for the reorganization, improvement, or construction of new practices or environments that are increasingly universally inclusive. The study was carried out with the awareness that it is in functional and life-oriented training contexts (Giaconi, 2015) that it is possible to acquire attitudes that can make people resilient in their professional and social life. Therefore, the need emerges to structure daily listening spaces and planned surveys so as to organize the services and the supports according to the actual and changing needs of the person. Proactive framework aimed at encouraging the exercise of self-advocacy and active participation, as well as the increasing of personal agency for an independent life is necessary (Caldin, 2016). In this direction, we hope to increase moments of co-planning, in which also students with disabilities can help and organize proposals that know how to respond effectively to their needs, proceeding from the perspective of collaborative design for all (Giaconi *et al.*, 2019).



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