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Universal Design for Learning: the relationship between subjective simulation, virtual environments, and inclusive education

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Abstract

The universality of the educational activities must be in agreement with a series of systems that involve the universality of the subjects who learn and their physical, mental, belief, race and religion differences. The possibilities promoted by an immersive education —made of stimuli aimed at transformation through the use of virtual environments and tools for the use of 3D 360° —are constituted as tools that better interpret the empathic and neurocognitive characteristics of the subjects and therefore the substratum an apprentice on which the cultural dimension is placed, this finding crosses the Universal Design for Learning. Proceeding towards the organization of modular and modular three-dimensional virtual environments responds to all the needs connected to the subject's formation and constitutes a surprising integrative and inclusive tool in the explanation of the implicit processes of knowledge. We intend to start an experimental phase of study for the possibilities offered verification by this integration, using Federico 3DSU virtual platform to create in its interior, virtual environments involving nine guidelines in CAST in 2008, as well as check out the possibilities pedagogical-didactic.

Keywords: *Inclusive Education, Teaching and Learning, Universal Design for Learning, virtual environments, subjective education*

1. Theoretical framework

Formation means taking part in the process of transformation that concerns both the subject and the teacher. In this dual dimension on one side and plural on the other, primarily when referring to a group of people who are formed, the responsibility of the educator is to realize an educational dimension that can involve all those who are part of the community that is proceeding towards new learning. This dimension of totality, which we will call the universality of educational and formative acts, should, democratically, involve every subject with its characteristics, functioning, and peculiarities. The universality of the educational activities must, therefore, be in agreement with a series of systems that involve the universality of the subjects who learn and their physical, mental, belief, race and religion differences.

To encourage an inclusive approach of educational systems in line with the protocols of the *Capability Approach* (Robeyns, 2005) and of the *International Classification of Functioning, Disability and Health* (ICF, 2001), it's necessary to find a series of operative indications that allow all the information present in the two protocols to be implemented practically within the various educational and scholastic systems.

In line with the desire to create genuinely inclusive educational systems aimed at "empowering" and "reinforce" those in difficulty, it took place in the 1980s - inspired by the principles of *Universal Design* promoted by some American architects (Welch, 1995; Mace, 1997; Story, 1998) - an organizational tool of teaching and learning spaces called *Universal Design for Learning* (Rose, 2000; Rose, Gravel, Gordon, 2013).

Universal Design for Learning (UDL), with its main characteristics and those derived from the implementation of the same principles, responds to the need to relate the universal function of education and training with the possibility of teaching aimed at creating occasions, situations —real and virtual places that can involve each subject in their diversity.

In our proposal for interpretation and enrichment of UDL[1], a significant role can be played by the virtual and immersive reality capable of stimulating what is called "subjective simulation" that we will face later, with the theoretical and practical intent of proceeding with a plot between UDL and Virtual and Immersive Learning Environments.

The role of subjectivity and difference, however, is realized in practical terms in organization and structuring of models that tend to guarantee all the subjects in a paradigm that sanctions the very reason of the formative phenomenon in the differences. In this paradigm, we no longer speak of "compensatory tools" or "dispensative measures" as it is characteristic in the Italian school referred to when we refer to Special Education Needs, but of educational planning aimed at facilitating already in the construction of a learning environment or a lesson the process of inclusion.

The emphasis isn't only on the possibility of accessing a content by those with difficulties, disabilities, disturbances but on the organizational, creative and training ability of the teacher to guarantee everyone from the first stages of planning of the training intervention and of the environments used, up to the achievement of educational results for each one in its diversity (Mangiatordi, 2013).

Universal Design for Learning, however, isn't designed to merely determine access to knowledge, this is not its function, but to guarantee everyone the possibility of recognizing, empower and facilitating learning dynamics (Rose, Gravel, 2010, p.220). This capacity for the empowerment of each subject could open up to the topic of educational flexibility as a supporting idea on which to build curricular paths for each one.

The theme of flexible education (Santoianni, 2014) calls to mind its own possibility the brain is its plasticity as a physiological ability to generate new connections from new learning processes. This perspective and hypothesis define the subjective nature that should have every educational act.

UDL opens the opportunity to think about the learning process of each subject in advance, since the conception of the programs, activities, context ensures each individual their subjectivity favoring their physical and mental characteristics. The subject is not imagined as a "container" or "collector" of topics but is oriented to recognize, independently, their transformation process (Bandura, 1996).

We can define the UDL as a push process to the autonomy of the subject (Luhmann, Schorr, 1999), making it a highly inclusive education model. That is why the change, evolution, modification of the contexts in the society of which it is part cannot realize in educational systems where no predisposition to change it with increasing incentives and substantial strength to everyone, not just for a part (Bruner, 2000).[2]

In the development of subjectivity, especially when we imagine the variety of the "operation" of everyone, we cannot underestimate the role they can take in education, an inclusive design that tends to value, in environments designed for training purposes, the peculiarities of each. The *UDL* is achieved first through the ability that the educator has to act consciously in line with *UDL* (PUA) (Savia, 2015). The central element of this paradigm resides in the knowledge that learning, in all its forms, both substantially to the human individual par excellence: diversity. This finding determines the need to determine articulated processes of flexible differentiation of the curricular proposal, whose matrices have bases of neuroscientific and pedagogical studies.

In this overall reorganization of the traditional curricular systems, there is an active discussion on the opportunity to overcome the concept of "media," whether it concerns school programs or concerns technological structures and tools.

Establishing, in fact, a general parameter of mathematical "media" distribution of the results produced by training, doesn't guarantee the possibility of identifying diversity as a possibility and not as a limit.

In this sense, the UDL aims at overcoming the concept of numerical-arithmetic voting at the base of the formative evaluation in favor of a training process that aims to "involve, represent and provide modes of action and expression" to allow the explication of the individual diversity.

In the second version of the CAST guidelines (2008) - an organization in support of the deployment and the continuous implementation of UDL, born in 1984 north of Boston in the United States - the introduction states the educational objective of the 21st century doesn't lie in the ability/mastery of knowledge or the use of technology but in

[1] The tool, conceived as an open resource, allows scholars of different fields, educators and pedagogists to implement the guidelines and offers the opportunity to incorporate possible extensions, variations, tools and methods.

[2] The *brain-body system* assumes significance concerning its worldliness, that is, its permanence in place, time and space. This vision of things should lead us to imagine any scientific analysis of a neuroscientific-cognitive, learning, formative matrix, with the awareness that any approach has in itself meaning within a context within which all subjects develop. The individual, whatever his state of health, is realized if he succeeds in affirming his dimension in a context. It is from the methodological opportunity given by the observational tools in which the dual biological and cultural characteristic of the individual has recognized that one recognizes a functioning system which is such as inclusive of the two dimensions of each difference (Szaszkiewicz, 1988). The formation must act knowing, integrating and analyzing these two dimensions.

the "expert" competence to manage learning processes. Realizing that adequate educational strategies that allow the subject to be realized as an expert in the dynamics apprenditive. The fundamental principles of the guidelines that make up the *UDL* are: 1. to provide multiple representation situations (I. Provide Multiple Means of Representation), soliciting the perception, languages, expressions, symbols and understanding; 2.Provide multiple occasions of action and expression (II. Provide Multiple Means of Action and Expression), support the physical action, expression and communication, stimulate executive functions; 3. provide multiple opportunities for involvement (III Provide Multiple Means of Engagement), attract interest, support effort, and persistence, encourage self-regulation.

Within these guidelines, my idea is that substantial space can be recovered from an approach mediated by virtual and immersive contexts able to solicit the mental dimension of the subject in difficulty through the intrapsychical characteristic of subjective simulation (Calvani, Bonaiuti, Pettenati 2011).

If educational success is determined by understanding the learning processes making accessible the educational results, the methods, the materials, and the evaluation (Rose, Gravel, 2010, p.220), good UDL cannot create contexts able to mediate between the context and the subject, even virtually[3].

In this case, the ability to go beyond the possible represented by the data of the contingency - however, solicited by them - that the subject simulates, moves, proceeds, anticipates the new situation in a mental process of organizing the possible beyond the present. The formative act must, therefore, tend to the solicitation of constant degrees of subjective activation of simulative acts, that is why it cannot tend to the confirmation but the structuring of the self in articulated processes of reorganization of the present.

2. The subjective simulation, the immersive and virtual environments, and the possible interactions with UDL

The possibilities promoted by an immersive education - made of stimuli aimed at transformation through the use of virtual environments and tools for the use of 3D 360 ° - are constituted as tools that better interpret the empathic and neurocognitive characteristics of the subjects and therefore the substratum an apprentice on which the cultural dimension is placed, this finding crosses the UDL (Aquario, Pais, Ghedin, 2018) substantially.

The creation of virtual environments simulating life contexts offers another possibility that it can implement environmental elements stimulating which present additional opportunities for the educator and the student with the chance to develop inclusive technology environments.

This feature allows us to imagine virtual environments, environmental contexts recreated on the computer and made attractive and formative, as privileged tools for the realization and "Universal" design "" because they allow us in their enormous modifiability, creativity, and diffusivity to "provide multiple representation situations," "provide multiple occasions of action and expression," and "provide multiple opportunities for involvement."

The learning environments and adequate stresses result in assimilation. Subsequent arrangement should allow an amending possibility on the part of the learner to make him feel a "structural coupling" with the educational situation (Santoianni, 2014). Some research suggests that engagement in learning actions is strongly stimulated by the mutual interaction between those involved in the learning process and the learning environment itself (Shernoff & Bempechat, 2014; Fraser, 1998).

For Schernoff (2016) the peculiarities and quality of learning environments should be theorized in terms of environmental complexity, the simultaneous presence of environmental challenges and environmental support.

The environmental challenges refer to the tasks to be realized by the students, the activities, the objectives, the structures, and the expectations guiding them to activate themselves and to stimulate their thinking and with these hypotheses to structure an environment capable of realizing dynamic learning processes (Csikszentmihalyi, Rathunde, & Whalen, 1993; Hektner & Asakawa, 2001; Santoianni, 2012).

In this sense, the complication of environments comes as a system of active *engagement* in the processes of implementation of the levels of attention and learning that can be modified in relation to the levels of adaptability that can already be solicited by the primary school (Santoianni, 2012).

[3] The activism started from considering the experiential action not so much in its productivity determined by the action as by the possibility that it opened to internalize simulation processes of future possibilities. We find again in the same Dewey (1981, p.74) the idea that the activity should "move towards an ever-increasing use of the scientific method to promote the possibilities of an experience of growth and expansion" of the subject.

Schernoff's studies (2013) identify three primary variables in the realization of reasonable levels of interest in teaching-learning dynamics all connected to the realization of cognitive *flows* capable of realizing deep learning dynamics: *the commitment in behavior*, the ability to maintain a commitment to ensure consistency of effort, participation, attendance at classes, fulfill assigned tasks, and the ability to maintain a reasonable level of consistency with other desired academic behaviors.

The *cognitive engagement* refers to investments which involve the student in learning, processing depth, and the use of self-regulated metacognitive strategies. *Emotional engagement* refers to the effect and emotions of students in schools, such as interest, boredom, or anxiety.

All these characteristics seem to be entirely in line with the indications contained in the CAST document that accompanies the American approach to education according to the principles of the *Universal Design for Learning*. In addition, the concepts underlying this vital document, already used in American colleges and universities, don't conflict with other education systems except to the extent that it makes structural and organizational interventions necessary for its realization. The technological-medial breakthrough would offer further advantages on the possibility of realizing virtual environments oriented to the single subject in difficulty as it allows activating, through the virtualization of environments and tools, those mental processes at the base of both action and movement even when the same aren't possible in reality.[4]

It's seen as the commitment of the students is not only multi-dimensional, , but also dynamic, floating, context-dependent, and highly interactive (Goldin, Epstein, Schorr, & Warner, 2011). This interactivity, if it is beneficial for those suffering from different problems, would be even more for those who do not present difficulties.

All this is feasible if the teacher can act concretely on the learning environments, determining the complexity understood as the potential to realize stimulating paths in which to find environmental challenges and environmental supports.

The so-called "spatial turning point" solicited by the Santoianni in pedagogical field (2017), aimed at representing the organizational dimension of the real spaces intended for formal education is expanded in a subsequent anticipatory, simulative and therefore neurocognitive matrix of educational processes in virtual environments within which the subject is stimulated through environmental tasks and supported for the resolution of the same.

In this sense, immersive virtual environments have an extraordinary potential for the creation of support and dynamic organization of learning paths aimed at an approach that involves educational planning in all its aspects (Ghedin, Mazzocut, 2018).

In this case *UDL* intends to solicit "perception, languages, expressions, symbols, and comprehension," as well as "solicit the physical action, expression and communication, stimulate executive functions" and "attract interest, support the effort and persistence, encourage self control." In line with UDL, students "may find additional construction space with the possibilities offered by virtual environments."

, the UDL promotes within its guidelines the solicitation by the educator of the physical action of its students and it is also realized in terms of simulation. This meets the needs of those who have motor dysphasia or disabilities because they are free to act through the presence of an avatar in a virtual environment that no longer sees them in their movements. In fact, numerous scientific studies have shown that *mirror neurons* and their ability to relate empathically to the other's neuronal system would also are activated in visual representations of body elements (arms, legs, body part joints), although they are virtual (Jeannerod, 2001; 2013; Jeannerod, Decety, 1995). In fact, the same area of the brain comes into operation when we imagine a movement and when it is planned (Oliverio, 2012).

The Virtual Learning Environments (Virtual Learning Environments) (Goldberg & McKhann, 2000) demonstrate a higher capacity for involvement for the students but also the development on equal terms (like texts, materials, tools)

[4] The nine guidelines developed within the document CAST (2008) are presented as central activities to put into practice for the construction of adequate educational programs and inclusive environments. Options that customize the display of information; provide alternatives for auditory information; options that provide alternatives for visual information; options defining vocabulary and symbols; options that clarify syntax and structure; options to decode text or mathematical notation; options that promote interlinguistic understanding; options that illustrate key non-linguistic concepts; Options in the media for communication; options in the tools for composing and solving problems; for the placement for the practice and performance; options that guide an effective setting of goals; options that support planning and strategy development; options that facilitate the management of information and resources; options that improve the ability to monitor progress; options that increase individual choice and autonomy; options that increase relevance, value and authenticity; and options that reduce the threats and distractions; options that increase the relevance of objectives among the objectives; options varying levels of challenge and support; options that promote collaboration and communication; options that enhance mastery-oriented feedback options that drive personal goals and expectations; options that enforce coping skills and strategies; and options that develop self-assessment and reflection.

for better performance for those who are involved in learning processes mediated by virtual environments in which there are texts, audios, animations.

This dimension, already tested in virtual environments to project the subject to immersive levels in a three-dimensional experience, contributes to structuring meaningful experiences regarding commitment and cognitive implementation (Gardner, Gánem-Gutiérrez, Scott, Horan, & Callaghan, 2011; Foster, 2007; Hew, Cheung, 2010).

Oliverio (2002) believes that there is no supremacy of the mind and thought about actual action; in this sense, action is a proper element of the mind and its processes, which are activated by the movement itself. Considering this, movement, gesture, physical action, would not be a consequence of an anticipatory structuring of the mind but a substantial aspect of the mind itself: the same thinking "would be nothing else than deciding what movement to achieve later" (p. 7).

The patterns and motor memories acquired by children are both physical and mental processes inserted into a subsequent procedural memory; this highlights the force of two dimensions, one of which is explicitly represented by the physical reproduction of the gesture and the other constituted by the mental memorization of the realized scheme.

Therefore, if the schema has a mental/implicit nature, we can think of systems of representation of spatiality and of the realization of the gesture that subsists in a mentalized, immaterial but present form (Santoianni, 2014). This opens up the opportunity to create virtual environments designed to simulate and stimulate such schemes to implement, organize, and implement them to solicit significant epigenetic processes even in those with specific learning disabilities and motor disabilities.

Replace virtual spaces in three-dimensional environments in which the individual is free to act and to learn from the virtual reality within which it is involved is a strong possibility given the need for transformation of the environments within which we make the educational process. This possibility could be complemented by the structuring of environments that are in line with prototypical learning and therefore with *the theory of elementary logics* (Santoianni, 2014). Structural coupling, give the opportunity to the trainer and the trainer to reset the paths training taking into account the implicit logic of learning on which all other explicit knowledge will be structured.

We believe that immersive educational realities and simulated virtual environments contribute to conscious action on the explicit-implicit levels of learning of each one. They also contribute to meeting the needs of the teacher to organize stimulating environments, including promoters and real learning processes; to make simulated spatiality an effective place of attraction towards the student. In this capacity, there is a compelling possibility of restructuring inclusive educational processes.

3. Operational hypothesis

Proceeding towards the organization of modular three-dimensional virtual environments responds to all the needs connected to the subject's formation and constitutes a surprising integrative and inclusive tool in the explanation of the implicit processes of knowledge.

These peculiarities make the virtual environments, immersed in an immersive way, strongly indicated for the development, training, and education of all the subjects in a perspective that regards the academic plan. In this hypothesis, *UDL* could represent an extraordinary paradigm within which to move to determine an actively inclusive pedagogical-didactic approach through the study, the structuring, the design, and the experimentation of an interactive model between indications of the UDL and Environments Immersive and virtual. We intend to start an experimental phase of study for the possibilities offered verification by this integration, using the Federico 3DSU virtual platform to create in its interior, virtual environments involving nine guidelines in CAST in 2008, as well as check out the possibilities pedagogical-didactic.

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