Journal of Inclusive Methodology and Technology in Learning and Teaching
ISSN 2785-5104
Anno5 n.2 (2025)

EDIZIONI UNIVERSITARIE ROMANE
editoria scientifica dal 1952

# Embodied Education in the framework of Universal Design for Learning: connections and synergies

**Lia Daniela Sasanelli[1,*], Giulia Ranieri [2] and Rossana Campanale [2]**

[1]Università Telematica Pegaso – liadaniela.sasanelli@unipegaso.it
[2] Università degli Studi di Bari – g.ranieri29@phd.uniba.it; r.campanale10@phd.uniba.it
*Correspondence: liadaniela.sasanelli@unipegaso.it

**Abstract:** The paper explores the intersection between *Embodied Education* (EE) and *Universal Design for Learning* (UDL) in an integrated design system that recognises the body as a primary mediator in the active construction of knowledge, and considers immersive technologies as tools to enhance student engagement, promote sensory integration, and support personalised learning processes. With reference to the recent UDL 3.0 Guidelines (CAST, 2024), the most relevant and closely related considerations for promoting the use of the body and new technologies to realise a learning environment that accommodates individual differences through the plurality of modes of representation, action, expression and engagement are traced. The contribution is enriched by a didactic proposal aimed, in particular, at primary school.

**Keywords:** Embodied Education; Universal Design of Learning; meaningful learning, primary school, technology.



## 1. Introduction

In the changing contemporary educational landscape, characterized by increasing social, cultural and technological complexity, there is an increasingly urgent need for critical reflection on traditional teaching practices in light of new epistemological paradigms capable of integrating the cognitive, emotional and bodily dimensions of human experience. Learning can no longer be conceived as an exclusively mental and disembodied process, but must be rethought in terms of a situated, relational processuality that is deeply interconnected with bodily and affective experience. As Antonio Damasio (1994) states, "the body provides an indispensable foundation for the mind, not only as a biological support, but as co-constitutive of its cognitive operations" (p. 226), highlighting how bodily dynamics are indispensable for the construction of meaning.

From this perspective, Embodied Education emerges as a theoretical and methodological paradigm capable of responding innovatively to the educational

[1] Il contributo è frutto di un lavoro condiviso. Ad ogni modo, ai fini dell' attribuzione Lia Daniela Sasanelli ha scritto i paragrafi 4 e 5; Giulia Ranieri l'introduzione e il paragrafo 2; Rossana Campanale il paragrafo 3 e le conclusioni.

challenges of the present, proposing a reconceptualization of learning as an embodied, multisensory and situated process. Supported by solid neuroscientific and psycho-pedagogical foundations, this approach recognizes the interdependence of mind, body and environment, promoting educational practices oriented toward the full appreciation of subjective experience in its totality. In this framework, technology is no longer conceived as a mere ancillary tool, but as an interactive and transformative space that, if consciously designed, can amplify student engagement, foster sensory integration, and support deeply immersive and personalized learning processes.

## 2. Theoretical foundations of Embodied Education: the body as an instructional mediator

In recent decades, the landscape of theoretical studies in the cognitive and pedagogical sciences has undergone a profound renewal, marked by the emergence of embodied perspectives that recognize bodily experience no longer as a subordinate dimension, but rather as a supporting and generative structure of cognition. As Lakoff and Johnson (1999) point out, "the mind is not something disembodied that operates independently of bodily structures, but is shaped by our body's capacities, sensory experiences, and situated interaction in the world" (p. 3), highlighting how all forms of understanding and conceptualization are rooted in the bodily and perceptual activity of the individual. In this context, the *Embodied Cognition* approach has progressively established itself as a prominent theoretical reference, proposing a holistic view of the mind, understood as an integrated and situated expression of the body in relation to the environment. As Gomez Paloma (2017) points out, "the cognitive act is not the mere product of abstract mental processing, but arises from the situated and multimodal interaction between body, mind and experience, constituting itself as an embodied, contextualized and affectively oriented process" (p. 45).

According *to Embodied Cognition*, thinking is situated, distributed and rooted in corporeality, and mental operations-including the understanding of abstract concepts-are deeply influenced by sensory and motor experiences (Barsalou, 2008).

The pedagogical implications of this view are relevant, as they suggest that learning is achieved in a deeper and more lasting way when it simultaneously involves the cognitive, affective and bodily dimensions of the subject. In this framework, the body is configured not merely as a vehicle for educational action, but rather as a primary epistemic mediator, through which the subject constructs, reframes and consolidates knowledge (Gallagher, 2006).

This conception is at the heart of *Embodied Education* pedagogy, which postulates that all authentic knowledge is necessarily embodied, that is, mediated by perceptions, movements, actions and sensorimotor interactions. The body constitutes the "first space of learning," in which formative experiences are rooted and the intrinsic relationship between theory and practice is made concrete. As Shapiro (2019) argues, cognition is inherently embodied: cognitive processes emerge from a dynamic interaction between brain, body, and environment.

Supporting these assumptions is the contribution of contemporary neuroscience. In particular, research on mirror neurons has shown how the observation of an action activates the same cortical areas involved in its execution, revealing the existence of a neural circuit that deeply links perception, action and understanding (Rizzolatti & Sinigaglia, 2006). Such a neurobiological mechanism, in addition to representing the

basis of motor learning, is configured as the foundation of empathic understanding and social cognition, highlighting the inseparability of bodily dimensions in learning processes.

In parallel, the concept of *neuroplasticity* - that is, the ability of the nervous system to change its structure in response to environmental stimuli - further reinforces the idea of dynamic, situated and plastic learning. Educational contexts that activate the body, senses and emotionality promote the formation of stronger and more articulated synaptic connections, enhancing the effectiveness of the learning process (Immordino-Yang & Damasio, 2007). Also within this theoretical framework is the paradigm of *ecological learning* (Gibson, 1979), which conceives of knowledge as an outcome of the active interaction between organism and environment, through *affordances* that the body is called upon to explore, manipulate and experience. The above acquisitions confirm that the body acts as a cognitive, affective and relational device, indispensable in the genesis of meaning. The embodiment of knowledge is not exhausted in the executive dimension of acting, but becomes a matrix of understanding and transformation, through which the subject elaborates concepts, shapes mental representations and consolidates learning. The acting body is thus configured as a semiotic and pedagogical mediator, capable of transforming knowledge from conceptual abstraction to integrated experience, deposited in sensorimotor memory (Damasio, 2010).

It is not only the cognitive sciences that emphasize the epistemological primacy of the body: numerous prominent thinkers, authors and writers have recognized, in an intuitive and prescientific key, the centrality of embodied experience. Walt Whitman, in his *Leaves of Grass* (1855/2005), states that "the body is the soul," suggesting a monistic view of the human being, in which matter and spirit coexist and mutually determine each other.

Marcel Proust, in the *Recherche*, expresses the evocative power of bodily memory through the famous madeleine scene, in which an involuntary sensory gesture reactivates an entire constellation of memories and meanings (Proust, 1913/2003).

In the field of education, Maria Montessori (1912/2000) anticipated many principles of *Embodied Education,* promoting teaching based on sensory exploration, fine motor skills and concrete interaction with the environment as foundations for structuring thinking. Similarly, John Dewey (1938) theorized experiential learning in which action is a necessary condition of understanding, enshrining the indissolubility between theoretical knowledge and practical activity.

In light of these considerations, it seems clear that the body constitutes the privileged crossroads between knowing and doing, between theory and reality. As Shapiro (2019) states, "concepts are rooted in the way we act and perceive the world, in bodily structures that shape our mental representations" (p. 27). Consequently, the educational environment should be shaped as a dynamic, manipulable, experiential space in which knowledge is constructed through sensory interaction, bodily exploration, and active participation.

*Embodied Education*, therefore, takes the form of a pedagogical proposal based on the integration of mind, body and emotion, geared toward overcoming the Cartesian dichotomy that has historically fragmented the unity of human experience. As Damasio (1994) states, the body and emotions are not accessories of the rational mind, but constitute an integral part of it, contributing decisively to decision-making, cognitive and learning processes. This model calls for a restructuring of teaching

practices, which should be rethought in a laboratory, cooperative, interactive way, valuing movement, corporeity and the affective dimension of learning. The use of the body in teaching, far from being limited to artistic or motor disciplines, intersects every subject area, becoming a privileged vector of signification, communication and understanding.

This approach is particularly relevant in early childhood and primary education settings, where symbolic thinking develops from perception and motor skills.

The theoretical and neuroscientific foundations of *Embodied Education* outline, therefore, a vision of learning in which corporeity assumes a primary epistemological function since "we do not simply think with our brains, we think with our bodies and through our acting in the world" (Shapiro, 2019, p. 15). Acknowledging this reality means paving the way for a more humane, profound and integrated education, capable of engaging the whole person and generating formative processes endowed with meaning, relevance and durability over time.

## 3. Immersive Technologies as a tool for interactive body learning

In light of the above, educational pathways need to be rethought and refounded to meet the challenges of an ever-changing environment. In a world where technology appears increasingly pervasive, schools cannot shirk the task of educating individuals in time and of time. Information and communication technology (ICT)-mediated instruction is not enough; the real educational challenge is to "make this mediating system increasingly *embodied* and interactive" (Finestrone et al., 2023, p.191).

In particular, in recent years, the technologies that explicate the continuum between the online and offline worlds turn out to be the immersive ones, as they are increasingly redefining the boundaries of learning, opening up new frontiers regarding the triad student, environment and educational content. These innovative tools offer educational experiences that engage not only the mind but also the body, creating learning environments that simulate physical experiences.

Immersive contexts, in fact, are characterized by their ability to engage the subject in an environment that activates all the senses, creating a direct connection with the learning environment in which the body is embedded. As argued by Finestrone et al. (2023), "an environment is immersive to the extent that it succeeds in tricking a person's cognitive and perceptual system into believing that he or she is in a different place than where he or she physically is" (p.191).

The student placed in an immersive context perceives himself present and at the same time an agent within the learning space. Such an experience enhances his or her motivation and participation, which are determining factors in the internalization of knowledge (Dangel & Mägdefrau, 2019).

As supported by several studies, experiences conducted at the immersive level, although they are "artificial," activate cognitive processes that develop knowledge and skills transferable to real-life contexts (Finestrone, 2023; Dengel, 2022; Makransky & Petersen, 2021).

Users' actions are *embodied*; they can move in a 360-degree structured environment and interact with the objects present by integrating their senses. In this sense, the integration of body, mind, and environment (Wilson, 2002; Shapiro & Stolz, 2019), which occurs in immersive contexts, makes the learner no longer just a passive user of content, but an active player in the learning experience.

Taking a closer look at the currently most popular immersive technologies shows how augmented reality (AR) and virtual reality (VR) are increasingly being integrated within educational pathways.

Their effectiveness is based on the concept of simulation: the most functional learning methodologies are those that confront the student with real situations, for the resolution of which he or she must apply previously acquired theoretical knowledge (Fernandez, 2017).

Virtual reality (VR) is a technology that creates a fully immersive and simulated environment, replacing the real world with a digital world that the user can explore through devices such as VR viewers, gloves or controllers. VR aims to make the user experience a fully artificial sensory reality, offering a feeling of "presence" within the virtual environment.

One example of the application of VR in education is the use of virtual simulations for teaching natural sciences. For example, in a biology lab, students can explore the human body in 3D, visualizing organs, tissues and biological systems from perspectives that would not be possible in a physical environment; they can interact with anatomical models, "perform" virtual medical operations or observe biological processes such as blood circulation in detail.

Augmented reality, unlike VR, complements the real world (Di Tore & Arduini, 2020). It is a technology that overlays digital elements, such as images, sounds, or information, onto the real world, creating real-time interaction between the physical and virtual environments. Users can view digital objects or data that integrate and interact with their physical environment, thereby enhancing their perception and experience of the real world. Tools used for AR include devices such as smartphones, tablets, smart glasses or specific viewers. An example in educational field is the use of AR apps for language learning, where students can interact with real objects labeled with foreign language words. This enriched experience helps students memorize vocabulary.

It is understood that both technologies promote *embodied* learning in which the motor, perceptual and emotional components contribute to the construction of knowledge.

The body is not only a vehicle for interaction with the environment, but an integral part of cognitive processes, directly influencing perception, action and memory. Immersive technologies, such as virtual reality (VR) and augmented reality (AR), create environments that actively stimulate sensory perception, motor interaction and emotion, making learning more engaging and meaningful.

In this sense, the body is not only a vehicle for interaction with technology, but an active mediator in the learning process, capable of directly affecting the immersive experience.

From a neuroscientific perspective, bodily interaction with VR and AR stimulates areas of the brain related to sensory perception and motor skills, creating a connection between the physical body and the virtual experience that is highly immersive. Gallagher's (2006) research on *Embodied Cognition* emphasizes how the body acts as an interface between the mind and the external world, facilitating a type of cognition that is inextricably linked to bodily experience. When, for example, a user interacts with a virtual object via a controller, his or her body adapts to simulate movement, building an experience that goes beyond mere vision, involving tactile, motor and spatial perception as well.

EDIZIONI UNIVERSITARIE ROMANE
editoria scientifica dal 1952

The human body, through its physical, emotional, and cognitive interactions, assumes a central role in the use of VR and AR: not only as an element that interacts with the digital environment, but as an agent that shapes the experience itself, giving meaning and depth to the interaction with the technology. The growing awareness of this bodily dimension in immersive technologies opens up new perspectives for the design and use of these tools in different fields, from education to psychological rehabilitation, emphasizing the importance of an approach that integrates body, mind, and technology synergistically.

## 4. *EE in the UDL framework: connections and synergies*

The greatest educational challenge facing schools today is that of inclusion. Classes are increasingly heterogeneous: foreign pupils, pupils with disabilities, DSA, pupils with socio-cultural disadvantage and increasingly diverse learning styles. Inclusion is a multifaceted and complex concept that concerns, not only "the physical presence of alunnə with disabilities in schools" (Ianes & Demo, 2022, p.19) or the attention paid to the ways in which their needs are met, but, in a broader sense, the valorization of the differences of individual subjects (Ianes & Demo, 2022).

"*Providing quality, equitable and inclusive education, promoting lifelong learning opportunities for all*" represents Goal 4 proposed by Agenda 2030. Inclusion and equity are combined to create an equitable school that has "the courage to 'make positive, compensatory and equalizing differences' toward those differences that if we did not act with equity would become inequality" (Canevaro & Ianes, 2022, p.10). Therefore, it is understood that in order to foster quality education from an inclusive and lifelong education perspective, we need to create a plural educational offer that gives voice to "the multiple individual, social and cultural differences that diverse alunnə bring with them based on their different histories" (Ianes & Demo, 2022, p.21).

For this reason, it is essential to reflect on the idea that the teacher possesses regarding the concept of inclusion, knowing that, what the teacher thinks, he or she conveys to others with his or her posture, voice, gestures, with the structuring of the teaching setting, and with a curricular design that is not one-size-fits-all, but plural, and that is attentive to the enhancement of the differences present in the school context.

Designing an inclusive curriculum means "not a *one-size-fits-all* solution, not a *one-size-fits-all* solution, but the use of flexible approaches that can be customizable and adaptable for each student's individual needs" (Savia, 2016, p. 23).

An innovative research framework that supports the concepts of flexibility, versatility, and universality is *Universal Design for Learning* (UDL), in that" it a priori provides for plural ways of responding to the multiple and varied needs of pupils, focusing specifically on learning preferences and modalities and needs in the areas of perception, reprocessing, exposure of learning content, and engagement in learning activities" (Murawski & Scott, 2019, p.17)

In light of studies in cognitive psychology and neuroscientific developments that demonstrate the variability and uniqueness of each student's learning processes by comparing them to "DNA or fingerprints" (CAST, 2018, p.8), UDL aims to ensure the opportunity for all to achieve educational success through valuing such diversity. Indeed, it is in that construct that the universality of the approach lies.

*4.1 The Embodied approach in UDL 3.0 Guidelines*

The UDL framework consists of three basic principles: engagement, representation and expression, each of which addresses specific cognitive, emotional and motivational needs of students.

The effective implementation of these three pillars is accomplished primarily through a strategic architecture: the UDL Guidelines. First conceived in 2008 by the *Center for Applied Special Technology* (CAST), they represent a dynamic and adaptable framework that is constantly evolving, reflecting the latest learning research and best practices in inclusive education. The goal is to design learning environments that dramatically reduce barriers to learning by validating and capitalizing on all the differences inherent in students.

The UDL Guidelines, therefore, offer an essential but effective scaffold for proactively identifying and countering such barriers and intentionally structuring contexts and experiences that enhance the diverse cognitive and learning modalities of all students. The latest version, published in July 2024, incorporates and complements the *EE* approach by placing the body's interaction with the environment at the center as an integral part of the learning process.

Both approaches recognize that students are not passive receptors of information, but active agents in their own learning process. UDL promotes active learning by providing *multiple means of representation, action and expression,* allowing students to choose how they access content, engage with it and exhibit their knowledge (CAST, 2024). EE promotes active learning through activities that engage the body and senses, such as movement, play, and exploration. The recent *UDL Guidelines 3.0* (CAST, 2024) reflect the emphasis on active learning particularly through the guideline "*Designing Multiple Means of Action and Expression"* which encourages educators to provide students with multiple options for responding, navigating, and moving through the learning environment (consideration 4.1).

This includes the recognition that physical movement is an integral part of the learning process and that students should be free to move and interact with the environment through forms and ways that support their learning. Therefore, it is no longer possible to ignore cultural differences that influence how students physically move or interact during learning. In some cultures, learning may be seen as a solitary intellectual activity that privileges silence and reflection; in others, movement, singing or collective dialogue are natural modes of engagement. A competent and inclusive teacher must be able to perceive these differences and adapt his or her teaching practices so that students can express their learning through modes that are culturally and socially meaningful.

Another relevant UDL guideline is "*Designing multiple means of engagement*," which includes the considerations "*Optimizing choice and autonomy*" (7.1) and "*Cultivating joy and play*" (7.3).

Through these suggestions, we want to recognize the importance of creating learning environments that are engaging, motivating, and fun for all students. EE can contribute to this by providing activities that engage students' bodies, senses, and emotions, creating a more meaningful and memorable learning experience (Shapiro, 2019). In this regard, it should be pointed out that the traditional educational system has often emphasized "silent" and "rigid" learning, where students are asked to sit, in silence, and write or read. Although these approaches may be useful in some contexts,

now it must be recognized that learning does not occur through silence or passivity alone.

Students should be free to explore new forms of expression, which may include speech, movement, singing or other more dynamic modes.

By overcoming the idea that learning must be contained within static limits students' natural curiosity and intrinsic motivation can be enhanced.

## 5. EE- UDL integrated design: an operational proposal

The instructional design proposed here (Tab. 1), is part of an *embodied* approach that recognizes the body as a central element in learning, capable of integrating the sensory, motor and cognitive aspects while incorporating the three principles of UDL. The goal of this design is to stimulate understanding of the topic (the water cycle) in fourth-grade primary school students through experiences that physically engage students and cause them to explore scientific concepts through movement, sensory interaction and the use of technological resources. Each group will be tasked with exploring the stages of the water cycle, using both three-dimensional models and digital technologies. In this context, the *embodied* approach is not limited to the simple integration of technologies, but promotes sensory interaction that facilitates learning through movement, touch, and vision.

The instructional design responds to the different needs of students, providing opportunities for active participation even for those with motor or sensory difficulties. For the former, tools are provided to facilitate interaction with models, such as height-adjustable tables and ergonomic supports. Students with visual or hearing difficulties, on the other hand, can benefit from technological devices that amplify sound or improve visibility, making the experience even more accessible. In addition, personalization of learning, a central aspect of UDL, is achieved through the flexibility of the activity and the variety of tools used. The *embodied* approach adapts to the individual characteristics of pupils, ensuring that every student can actively participate, regardless of their background or difficulties.

**Table 1** - Example of instructional design

| | |
|---|---|
| **Learning objectives** | - Promote conceptual understanding through sensorimotor experiences;<br>- Develop transversal skills related to active citizenship and sustainability;<br>- Develop the ability to critically analyze digital technologies;<br>-Encourage cooperative interaction among peers through group activities. |
| **Specific disciplinary objectives** | -Observe and describe the main natural phenomena through direct experience and the manipulation of concrete materials; |

| | | |
|---|---|---|
| | - Understand and represent the phases of the water cycle;<br>- Use recycled materials in a conscious and creative way;<br>- Experiment with the use of digital tools and augmented reality environments;<br>- Stimulate critical thinking on social and environmental sustainability issues. | |
| **Digital resources and tools** | Tablet, Digital Board<br>Google Earth e Voyager Stories<br>Height-adjustable multi-touch interactive tables<br>Eye-tracking e switch access<br>Text-to-speech software and screen readers<br>Apps with automatic subtitling and LIS translation<br>Padlet; Kahoot!; Wordwall; Mentimeter | |
| **Step 1: ENGAGE** | In line with the first principle of UDL (Designing multiple modes of involvement), the teacher using the *Blabberize* platform, shows students an animated image that introduces the topic of the water cycle and the importance of good sustainable practices.<br>After viewing the animated image on Blabberize, the students are invited to mimic in a circle, with free movements, the actions of water in the natural cycle (e.g. "jump" by evaporation, "fall" by precipitation). This activity activates the body-kinesthetic intelligences and stimulates emotional and physical participation. | UDL 3.0 – Guideline 7 -Sustaining interest: multisensory and emotional engagement. Embodied: the body as a vehicle of meaning, activates kinesthetic intelligence, increases participation and emotional anchorage. |
| **Step 2: EXPLORATION** | In line with the second UDL principle which aims to diversify the presentation of content, meeting the different learning methods by students, the teacher proposes an activity that includes augmented reality. | UDL 3.0 – Guideline 1 - Offer options for perception: flexible access to content. Embodied: spatial and visual simulation related to body orientation. It favors mental rep- |

| | | |
|---|---|---|
| | Specifically, students use tablets to visualize the phases of the water cycle through a digital simulation using *Google Earth* and *Voyager Stories*. In this way, the body acts as a mediator of concepts, making the student an active protagonist of the teaching-learning process.<br>Subsequently, a path is organized outside in stations, where each stage corresponds to a phase of the water cycle represented by specific movements (e.g. jumps, rolls, passages under blue veils or water nebulizers by "condensation"). The body becomes a tool to "cross" concepts, strengthening experiential memory. | resentations anchored in physical experience.<br><br>UDL 3.0 – Guideline 3 - Supporting understanding: activation of conceptual schemes through experience. Embodied: movement and environment as tools for active and multisensory learning. |
| **Step 3: ACTION AND EXPRESSION** | The teacher provides for the structuring of various practical moments (group work, laboratory teaching, gamification...) which provide for the consolidation and expression of what has been learned by the students, in line with the third principle of UDL (offering multiple modes of action and expression).<br>In class, students divided into groups, use recycled or easily available materials with the aim of creating the different phases of the cycle (evaporation, condensation, precipitation, accumulation) with models, reflecting on the importance of conserving water and the role that each individual can play in the management of natural resources.<br>In addition to making the models, each group creates a short choreography to represent the water cycle. Movements must be shared, coordinated and explained to the class, allowing students to symbolically represent scientific concepts with body language. | UDL 3.0 – Guideline 5 - Offering options for expression and communication): variety in ways of expressing what has been learned. Embodied: "hands-on" learning, reinforces understanding through manipulation.<br><br>UDL 3.0 – Guideline 6 - Offer options for executive functions: planning, organizing and communicating through alternative modes of expression. Embodied: the body translates concepts into gestures, creating a link between movement and knowledge.<br><br>UDL 3.0 – Guideline 8 - Developing self-regulation: immediate feedback, motivation and self-evaluation. Embodied (indirect): the playful and competitive component stimulates bodily and |

| | | |
|---|---|---|
| | Subsequently, interactive tests are proposed, created through Kahoot, so that students can consolidate the knowledge learned by analyzing their strengths and weaknesses and at the same time experiment with the use of an application. | emotional responses. |
| **Step 4:**<br>**REFLECTION AND DOCUMENTATION** | The teacher proceeds with a reflection on the entire educational path, obtaining immediate and timely feedback from students, who evaluate the effectiveness of the learning experience through platforms such as *Wordwall* or *Mentimeter*.<br>Following what has been discussed, the teacher introduces a *Padlet* in which each student can enter a message or a symbolic keyword based on the lessons faced and images that document the path taken. | UDL 3.0 – Guideline 9- Offering options for self-regulation: reflection on the process, metacognition. Embodied: the memory linked to the bodily experience helps to structure thinking in a more meaningful and lasting way. |

## 6. Conclusions

In light of the above reflections, it seems clear that the integration of *Embodied Education*, immersive technologies and *Universal Design for Learning* does not constitute a mere methodological update, but rather a radical reformulation of the educational act. The centrality of the body as a vehicle of knowledge, the conscious use of technology as a cognitive environment, and the adoption of a plural and flexible instructional design concur in the construction of educational pathways capable of accommodating the complexity and variety of human learning.

UDL and EE offer an alternative approach that values diversity in ways of learning, encouraging educators, teachers and trainers to create learning environments that are flexible, inclusive and responsive to students' individual needs. However, it is crucial to recognize that their actual implementation requires a fundamental shift in educators' beliefs and principles, starting precisely with the need to challenge traditional norms of "silent" or "rigid" learning. Indeed, the traditional educational system has often emphasized passive learning and conformity, a result that has been shown to be extremely detrimental to students who learn, instead, through movement and interaction.

In this scenario, the teacher is called upon to become a director of meaningful experiences, a promoter of dynamic and inclusive contexts, in which knowledge is not transmitted but is constructed through action, perception and interaction. It is only by recognizing the profound unity between mind, body and environment that it will be possible to shape authentically transformative, equitable and inclusive education.

EDIZIONI UNIVERSITARIE ROMANE
editoria scientifica dal 1952

## References

Barsalou, L. W. (2008). *Grounded cognition*. Annual Review of Psychology, 59, 617 -645. https://doi.org/10.1146/annurev.psych.59.103006.093639

Canevaro, A., Ianes, D. (a cura di) (2022). *Un'altra didattica possibile. Esempi e pratiche di ordinaria didattica inclusiva*. Trento: Erickson.

CAST. (2018). *Universal Design for Learning Guidelines version 2.2*. http://udlguidelines.cast.org/

CAST. (2024). *Universal Design for Learning Guidelines, version 3.0*

Damasio, A. R. (1994). *Descartes' Error: Emotion, Reason, and the Human Brain*. New York: G.P. Putnam's Sons.

Damasio, A. (2010). *Self comes to mind: Constructing the conscious brain*. Pantheon Books.

Dengel, A. (2022, maggio). Cos'è l'apprendimento immersivo? In 2022 8th International Conference of the Immersive Learning Research Network (iLRN) (pp.1–5). IEEE. DOI: https://doi.org/10.23919/iLRN55037.2022.9815941

Dengel, A., & Mägdefrau, J. (2019). Presence is the key to understanding immersive learning. In *Immersive Learning Research Network: 5th International Conference, iLRN 2019, London, UK, June 23–27, 2019, Proceedings 5* (pp. 185-198). Springer International Publishing.

Dewey, J. (1938). *Experience and education*. Kappa Delta Pi.

Di Tore, P. A., & Arduini, G. (2020). Il corpo e il testo: Il corpo nella realtà aumentata. *Ital. J. Health Educ. Sports Incl. Didact*, *4*, 56-60.

Fernandez, M. (2017). Augmented virtual reality: How to improve education systems. Higher Learning Research Communications, 7(1), 1-15.

Finestrone, F., Limone, P., & Peconio, G. (2023). Nuovi scenari di progettazione educativa: esperienze di didattica immersiva. I*UL Research,* 4(7), 190–203. https://doi.org/10.57568/iulresearch.v4i7.400

Gallagher, S. (2006). *How the body shapes the mind*. Clarendon press.

Gibson, J. J. (1979). *The ecological approach to visual perception*. Houghton Mifflin.

Gomez Paloma, V. (2017). *Embodied Education. Il corpo nella formazione: implicazioni pedagogiche, psicologiche e neuroscientifiche*. Milano: FrancoAngeli.

Ianes, D., & Demo, H. (2022). *Specialità e normalità? Affrontare il dilemma per una scuola equa e inclusiva per tuttə*. Trento: Erickson

Immordino-Yang, M. H., & Damasio, A. (2007). We feel, therefore we learn: The relevance of affective and social neuroscience to education. *Mind, Brain, and Education*, 1(1), 3–10. https://doi.org/10.1111/j.1751-228X.2007.00004.x

Lakoff, G., & Johnson, M. (1999). *Philosophy in the Flesh: The Embodied Mind and its Challenge to Western Thought*. New York: Basic Books.

Makransky, G., & Petersen, G. B. (2021). The cognitive affective model of immersive learning (CAMIL): A theoretical research-based model of learning in immersive virtual reality. *Educational psychology review*, *33*(3), 937-958.

Meyer, A., Rose, D. H., & Gordon, D. (2014). *Universal Design for Learning: Theory and Practice*. CAST Professional Publishing.

Meyer, A., Rose, D. H., & Gordon, D. (2024). *Universal Design for Learning: Principles, Framework, and Practice* (2nd ed.), CAST Professional Publishing, Wakefield.

Montessori, M. (2000). *Il metodo della pedagogia scientifica applicato all'educazione infantile nelle Case dei Bambini* (Ed. orig. 1912). Garzanti.

Murawski, W.W., & Scott, K.L. (a cura di) (2019). *Universal Design for Learning in pratica*. Tr. it., Erickson, Trento, 2021.

Novak, K. (2022). *UDL Now! A teacher's guide for applying Universal Design for Learning, third edition.* CAST Professional Publishing, Wakefield.

Proust, M. (2003). *À la recherche du temps perdu*. Gallimard. (Opera originale pubblicata nel 1913)

Rizzolatti, G., & Sinigaglia, C. (2006). *So quel che fai: Il cervello che agisce e i neuroni specchio*. Raffaello Cortina.

Rose, D., & Meyer, A. (2002). *Teaching every student in the digital age: Universal design for learning*. ASCD.

Savia, G. (a cura di) (2016). Universal Design for Learning. Progettazione universale per l'apprendimento. Trento: Erickson.

Shapiro, L. (2019). *Embodied cognition* (2nd ed.). Routledge.

Shapiro, L., & Stolz, S. A. (2019). Embodied cognition and its significance for education. *Theory and Research in Education*, *17*(1), 19-39.

Varela, F. J., Thompson, E., & Rosch, E. (1991). *The embodied mind: Cognitive science and human experience*. MIT Press.

Whitman, W. (2005). *Leaves of grass*. Barnes & Noble Classics. (Opera originale pubblicata nel 1855)

Wilson, M. (2002). Six views of embodied cognition. *Psychonomic bulletin & review*, *9*, 625-636.