UDL IN MULTIFACETED LEARNING ENVIRONMENTS RETHINKING TEACHERS' INCLUSIVE ROLE AND ACTION

L'UDL IN AMBIENTI DI APPRENDIMENTO MULTISFACCETTATI PER RIPENSARE INCLUSIVAMENTE RUOLO E PRASSI DEGLI INSEGNANTI

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ABSTRACT
The Universal Design for Learning is a tool making learning universally accessible; it highlights strategies suitable all to students (CAST, 2011) with different potential (Gola, 2024). As to neuroscientific research, UDL suggests an inclusive teaching mode fit to diverse learners (Rose & Meyer, 2006; Cottini, 2017). The contribution reports the adaption of the UDL Reflection Questionnaire (TKI-CAST) for teachers, using the Explanatory Design: Participant Selection Model (Creswell, Plano Clark, et al., 2003).

L'*Universal Design for Learning* è uno strumento volto a rendere l'apprendimento accessibile e suggerisce strategie adatte a studenti (CAST, 2011) con potenzialità diverse (Gola, 2024). Basato sulla ricerca neuroscientifica, esso suggerisce modi di insegnamento inclusivi e adatti a differenti apprendenti (Rose & Meyer, 2006; Cottini, 2017). Il contributo riporta l'adattamento dell'*UDL Reflection Questionnaire* (TKI-CAST) per gli insegnanti, utilizzando l'*Explanatory Design: Participant Selection Model* (Creswell, Plano Clark, et al., 2003).

KEYWORDS
UDL reflection questionnaire, neuroeducation research, inclusive teaching & education
Questionario di riflessione UDL, ricerca neurodidattica, didattica inclusiva

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Introduction

In recent decades, the issue of school inclusion has taken on an increasingly central role in the educational debate, pushing schools to rethink not only organizational structures, but above all teaching practices and the role of the teacher. In this context, Universal Design for Learning (UDL) resounds as an innovative and transformative theoretical-methodological framework, capable of orienting educational planning towards flexible and inclusive methods, and of responding to the growing heterogeneity of school contexts (CAST, 2011; Bocci & Gueli, 2019). In fact, UDL does not just offer adaptive teaching strategies, but proposes a real paradigm shift, according to which the accessibility of learning must be foreseen and integrated in the initial phase of planning, rather than compensated ex post (D'Alonzo, 2019; Savia, 2018).

This approach was born in the United States within the Centre for Applied Special Technology (CAST), whose works are inspired by the philosophy of "Design for All" and the experience of Ron Mace's Universal Design (1985), based on the principles of equity, flexibility, ease of use and reduction of effort. Applied to teaching, UDL promotes accessible learning environments, avoids the use of categorical labels and favours educational strategies for the valorisation of individual diversity. In this sense, the construct and ideal of being "universal" already encloses the concept of inclusiveness, suggesting a design capable of welcoming and supporting all learners, and respectful of their specific neurodiversity (Rose & Meyer, 2006; Gola, 2024).

The theoretical foundation of UDL is the paradigm of cognitive neuroscience, which has highlighted the variability of learning processes and the need to consider the individual as a single subject, with his/her own perceptive, affective and strategic modalities (Sousa & Tomlinson, 2012; Battro, Fischer & Léna, 2010). UDL identifies three main neural networks involved in the act of learning - representational, strategic and affective - generating the three guiding principles of the model: offering multiple means of representation, action and expression, and involvement (CAST, 2011). This structure allows teachers to develop differentiated teaching practices, activating both cognitive and emotional-motivational processes, promoting significant and lasting learning (Damasio, 1994; Krashen, 1982).

Considering these theoretical premises, this paper intends to explore the potential of UDL as a tool to reinterpret teachers' teaching practices in an inclusive way. In particular, the Italian adaptation of the "UDL Reflection Questionnaire", developed by the New Zealand Ministry of Education, is presented here, with the aim of stimulating a reflective self-assessment of their educational action. The research uses a mixed methodological approach (Mixed Method Research) and includes an initial qualitative phase of collection and analysis of teachers' perceptions, followed by the construction and validation of a quantitative instrument, the "UDLtest", intended to measure the perceived effectiveness of the inclusive strategies adopted (Creswell & Plano Clark, 2007; Ponce & Pagán-Maldonado, 2015).
In a school increasingly characterized by multifaceted learning environments, the adoption of tools that encourage teachers' critical reflection on their practices becomes crucial. In this sense, UDL does not only represent an operational model, but a conceptual device connecting the culture of inclusion with teaching innovation, neuroeducation research with professional teacher training, contributing to building educational contexts that are truly accessible, participatory and sustainable.

1. Inclusion as a vibrant implicit of UDL

The issue of school inclusion is a hot topic in the national and international scientific debate, and it leads us to outline the school as a context that focusing on the student (conceived as a whole person) and the educational relationship. Moreover, inclusion reshapes educational choices and actions with a special push towards social participation, in an atmosphere of networking with families, institutions and the territory.

In Italy, research on inclusion comes from afar and has its roots in the perilous history of integration, with a significative historical focus on theoretical and legal reflection and with a predominantly qualitative research tradition. We are still too often oriented towards integrating students with disabilities into school rather than including them, according to the paradigm of inclusive education, which has been discussed in Italy for just over ten years (Dell'Anna et al., 2023). In other words, there remains a tension between the ideals of inclusion and their practical implementation, often

characterized by processes that Ianes and Zagni (2024) define as “distorting” in the perception and interpretation of reality. According to the two authors, the full realization of the inclusive ideal presents some traps, such as that of the "rhetoric of absolute good", according to which inclusion is idealized without an appropriately critical look at reality or else the trap of "blindness and minimization", consistent with every uncomfortable and dissonant aspect of reality which is cut out from consideration.

The DisCrit and Disability Studies perspectives highlight how society tends to support an ideal of normality, building on this value logics of control and conservation of the status quo, even in the educational context. In this direction, these approaches highlight, for example, the critical issues of policies on Special Educational Needs, showing how they are historically based on conceptions of disability developed exclusively in the scientific, psychological and medical fields (Bocci, Cantatore, Lepri and Quagliata, 2022). They favour compensatory and dispensatory interventions, logics that often have repercussions even on foreign students in an intersection between racist and ableist narratives (Goodley et al., 2018).

However, the lawful path, marked by the Ministerial Decree of 27/12/2012 and subsequent Ministerial Decree no. 8 of 6/3/2013, as well as by some legal re- clarifications (Legislative Decree no. 96 of 7 August 2019 which corrected Legislative Decree no. 66 of 13 April 2017), aimed at regulating the management of inclusion at school. Although still entangled in a social categorization mechanism (Turner et al., 1987), inclusion is no longer intended as a sporadic fact, but as a pedagogical choice, a way to rethink and review the teaching system at all levels. Such a school system modulates, models and equips itself to guarantee "a quality of education for all that goes beyond the mechanisms of delegation or, even worse, charitable pity towards students with individualized and personalized school paths" (Zambotti, 2013, p. 165), and gives a new look at today’s learning environments which are increasingly heterogeneous, increasingly multifaceted. Andrea Canevaro has masterfully depicted these new learning and training environments, specifying that “Inclusion does not only concern predefined categories. It concerns everyone, including people with disabilities. In contemporary society, as well as in educational and school contexts, there are also boys and girls, young people, adults, elderly people with disabilities, (…), companions, husbands, wives, brothers, sisters, non- disabled friends who accompany or simply live relationships between genders, also contemplating the

impairment or limitation in their daily lives (...)" (Canevaro, Malaguti, 2014, p. 100). Today's educational world requires a perspective extended to all learning and educational contexts. Here, schools and communities become places of shared accessibility, capable of welcoming everyone, promoting each person in his/her entirety and ensuring teachers and educators adequate inclusive training.

In this perspective, the contribution of Universal Design for Learning (UDL) is very considerable, intended as a tool for re-reading and decoding the processes and routes of inclusion in the educational and teaching field. Developed in the 1980s by the Centre for Applied Special Technology (CAST), in the United States, defined in the 1990s, and published in its definitive version in 2011, later translated into Italian (Savia, 2016) with the name of '*Progettazione Universale per l'Apprendimento*' (PUA), UDL was born in the wake of the architectural, conceptual and cultural innovation inaugurated by Ron Mace, who outlined the principles of Universal Design (1985). Equity, flexibility, simplicity, perceptibility, tolerance for error, containment of physical effort, sufficient measures and spaces are traits that prepare the ideological framework for CAST's study & work and gives a 'universal' impetus to the construct of inclusion.

The UDL approach focuses on the creation of solutions oriented to all users, perfectly compatible with what is suggested by the UN Convention on the Rights of Persons with Disabilities (Baroni & Folci, 2022); this is in tune with the creation of products, structures, facilities and services for all, without requiring any specific adaptations or specialized designs. "Design for all", that is, designing with everyone in mind, is an innovative and transversal approach, useful in various areas, such as communication, space management, organization of public services and the dissemination of everyday products, so that they are accessible to the greatest number of people (Cesarano & Valentino, 2022). It is a person-centred design, which goes beyond the idea of standardized solutions and considers the needs, even those not explicitly stated, and the expectations of everyone (Montanari & Ruzzante, 2021).

In other words, UDL encourages the building of contexts that are ready and predisposed to facilitate learning and to make knowledge accessible to all, using methodologies and strategies that overcome standardizing labels or rigid classifications from the beginning (Bocci & Gueli, 2019). It represents a

valid reference framework capable of guiding educational practice according to a principle of learning flexibility, with an evident impact on the promotion of the whole person. Here, then, the adjective 'universal' contains the adjective 'inclusive' implicitly, but with the epistemological significance of a paradigm shift in educational planning, shifting from a compensatory/dispensative approach to a proactive and universal one; an educational planning aimed at promoting personalized and non-discriminatory interventions in educational paths (D'Alonzo, 2019; Savia, 2018).

2. The UDL *"neuroframework"*

The theoretical background of UDL is the paradigm of Cognitive Neuroscience, yet with a dense network of intersections with other scientific-disciplinary fields, such as Educational Sciences (with a particular focus on Teaching theory and practice) and Developmental Psychology. Hence the crucial consideration of the way people's neural diversity and the variability of their learning processes inevitably influence teaching mechanisms and educational relationships. From here, the next step seems to be that of tracing, within the conceptual framework of UDL, not only Cognitive Neuroscience *tout court*, but some aspects that pertain specifically to the neuroeducation framework, meant as a practical application of neuroscience in the classroom, even more as an "evolving landscape" that combines in itself "brain function, cognition (the nature, structure, and formation of knowledge), behaviour, and education (Gola, 2024, p. 7).

Variously internationally named (often with erroneous synonymous attribution) as 'Neuroeducation' or 'Educational Neuroscience', sometimes as 'Neuropedagogy' or, more broadly, traced back to the research stream known as 'Brain-based Studies', with the inevitable connection to the work of Battro, Fischer and Léna (2010) on the "educated brain" to which the other qualification of Mind Brain & Education is linked), the Italian 'Neurodidattica' (Herrmann, 2006) mainly deals with the implications that neuroscientific research in the educational field, implications of an applicative and methodological nature that innervate the entire learning/teaching process. This contribution is supported by modern neuroimaging technology that provides significant knowledge on the anatomy and brain processes underlying a wide range of human cognitive abilities, such as attention,

perception, language, memory. However, to benefit from this knowledge, to take advantage of it, it is important to conduct multidisciplinary research (Rueda, 2020, p. 210), combining different epistemological angles.

In the research range related to the brain mechanisms used in learning, studies on the application of neuroscience and neuroeducation methodologies stand out: for instance, we may consider the study of reading and writing (Dehaene, 2007; Wolfram, 2007), those on differentiated teaching on a neural basis within a learner- friendly-classroom (Sousa-Tomlison, 2012); studies on the relationship between bilingualism and working memory (Moreno and Bialystok, 2013, 2014) as well as the mechanisms of communication and neurolinguistics (Dilts, Grinder, Bandler & Bandler, Delozier, 1980). In many researchers, there arises the attempt to recognize the neural mechanisms that regulate cognition processes and relationship, as well as that of demarcation of cognitive styles (Battro, A.M., Fischer, K.W., & Léna P.J., 2010) and identification of learning principles according to a constructivist framework (Gülpinar, 2005); these concepts can be found in the background work conducted by the American group CAST (2011) for the development of the Universal Design for Learning (UDL). Moreover, there are the stimulating epistemic- conceptual assonances deriving from the Disability Studies approach that aims to 'disable' disability by re-centering the discourse of diversity on the idea of a 'context' (Oliver, 1990; D'Alessio, Vadalà, Marra, 2010; Goodley et alii, 2018). Contexts must be thought and conceived, ab initio, as respectful of any trait characterizing the person; contexts where any specificity, typicality, (neuro) variability can reside. On this axis, the UDL framework is certainly echoed by the perspective of the Index for Inclusion (Booth and Ainscow, 2002), according to which talking about inclusive *practices* is an action that necessarily follows that of building a *culture* of inclusion and managing *policies* for inclusion.

The intersection between the construct of 'inclusion', the neuroscientific and – perhaps more properly – the neuroeducational framework is expressed in the UDL structure through the identification of three neural networks that are activated in the act of learning: a representational network, a strategic network and an affective one. The guiding principles of UDL exactly arise from these three networks.

The first consists in providing multiple (various, different) means of representation, given that everyone perceives and processes information,

notions and knowledge in his/her own way. The representational capacity, which allows us to incorporate cognitive data provided by experience (Kolb, 1984), requires that the way of presentation (representation, precisely) of the learning contents is not univocal, but differentiated; unitary on a substantial level, but multi-coded on a formal level in order to facilitate a multi-level perception of the same segment of knowledge. According to Luria (1973), the brain area responsible for this representational operation is the posterior area of the cortex, more precisely, that primary visual cortex that explains the mechanisms of representation, in terms of vision, so much so that we can affirm with Rivoltella (2024, pp. 81-134) that the defining attributes of the 'visual brain' are – not by chance – three precise actions: representing, communicating, understanding.

If, to put it in linguistic terms, the first principle of UDL refers more to the development of receptive learning skills, the second principle is focused rather on the skills of producing and/or explaining knowledge. This is the principle of action and expression attributable to the work of the frontal area of the cortex (Meyer, Rose and Gordon, 2014), the headquarters of that neural dynamism that the learner exhibits in overcoming a series of challenging cognitive goals and deploying functional resources aimed at communicating what he/she has learned, what he/she knows. Planning, deciding, making a choice, identifying a solution, choosing between different options, organizing one's work effectively, are just some of the vectors that students develop with their own operational style and with a strategic mapping that, once again, is not the same for everyone.

The third principle of UDL is that of involvement, which concerns the affective network, or the result of motivations, interests and self-regulating drives that induce the learner to freely choose to access knowledge. Connected to the median area of the nervous system, responsible for controlling bodily reactions, developing motivation and managing emotions (Damasio, 1994), the principle of involvement includes a dimension of learning that immediately connects the cognitive level (performance, learning success, effectiveness) and the affective-contextual level (perception of significance and relevance of the training proposal and elimination of distractors or potential threats). We are not far from what Krashen (1982) asserts with his Affective Filter Hypothesis, applied to second language acquisition mechanisms. Krashen clarifies how the emotional context and the perception of the positive or negative tone in/of the educational relationship

can undermine or promote access to linguistic knowledge.

According to Nelson and Basham (2014), the tripartite structure of UDL should be integrated with four critical teaching elements: 1) the need for clear objectives; 2) the opportunity for planning that is intentionally addressed to the range of student variability; 3) the use of flexible methods and materials; 4) timely monitoring of progress. Hence the emergence of a five-phase model for implementing UDL in the classroom: a) clearly establish the expected outcomes; b) anticipate learner variability; c) carefully establish assessment and measurement plans; d) design the teaching experience in terms of micro-actions and/or activities; e) develop new knowledge and reflect on it. That being the case, the research presented here (in its intermediate phase), aims to take stock of teachers' perceptions of inclusiveness of their teaching practice, consistently with what is outlined by the theoretical assumptions of Universal Design for Learning. Furthermore, using a mixed research methodology, a validation process of a quantitative questionnaire is being set up starting from the exploratory work on the UDL Reflection Questionnaire.

2.1 The structure of the UDL Reflection Questionnaire

The *UDL Reflection Questionnaire* is a tool built in 2018 by a team (TKI team) from the Inclusive Education Department of the New Zealand Ministry of Education and modelled on the UDL Guidelines, published by CAST in the same year. It is the result of a ministerial validation on a large sample of the New Zealand teaching population of primary and secondary school levels, it follows the 3 areas of the UDL Guidelines (engagement, representation, action & expression), which are crossed with three thematic bands (access, build, internalize).

Used thanks to the collaboration of the TKI team of the Inclusive Education Department, which provided indications on the English translation of some Maori language entries, in an initial pilot phase, the questionnaire was translated, retranslated and adapted to the Italian context, then administered to a pilot sample consisting of 126 future teachers of the Degree Course in Primary Education Sciences at the University of Palermo in the Academic Year 2023/2024, attending classes of Evaluation Science & Lab, held by Prof. G. Cappuccio. This first administration allowed us to verify whether the translation of the items worked, and, thanks to the suggestions of the

teachers, further changes were made.

The questionnaire, which starts from the 3 neuroscientific principles previously illustrated (1. involvement, 2. representation, 3. action and expression), contains 9 guidelines, three for each principle or area, namely:

1. Provide options to promote interest.
2. Provide options to support effort and perseverance.
3. Provide options for self-regulation.
4. Provide options for perception.
5. Provide options for language and symbols.
6. Provide options for understanding.
7. Provide options for physical action.
8. Provide options for expression and communication.
9. Provide options for executive functions.

For each of the three areas (access, development, enhancement), the questionnaire includes 30 verification points or items such as, for example, “How can I make what I say more interesting?”; “How can I optimize the relevance, value and authenticity of what I explain?”; “How can I propose and support new challenges?”; “What usefuedback or anticipations can I provide to my students?” “How can I activate coping skills and strategies (personal management)?”; “What methods can I use to diversify the presentation of information?”; “How can I promote understanding between different languages?”; “How can I support the development of the skills needed to choose objectives?”; “How can I support the development of the skills needed to monitor progress?”

3. Research Methodology: Mixed Method, definition and research paradigm

The research path presented below uses Mixed Method Research because, as highlighted by Creswell & Plano Clark (2007), Greene (2007), Teddlie & Tashakkori (2009) and Creswell (2015), it uses both quantitative and qualitative methods, allowing the study to become more complete with specific elements of analysis and reflection.

In building the framework of our investigation we carried out the following activities, in line with what was expressed by Ponce & Pagán-Maldonado

(2015, p. 113):

a. Adaptation and translation of the qualitative UDL instrument
b. Administration of the qualitative UDL instrument.
c. Analysis and interpretation of qualitative data and construction of the quantitative instrument.
d. Analysis and interpretation of quantitative data.
e. Discussion of the results.

Ponce & Pagán-Maldonado (2015, pp. 114-116) provide, specifically, operational indications that we have translated for the research on the use of UDL as follows:

- *the identification of the nature of the problems in mixed research (premise)*. We decided to use the Mixed Method within our investigation to overcome any aspects of complexity present in UDL. In fact, to achieve the goal of an in-depth study of the phenomenon, it would have been reductive to use only the quantitative method or only the qualitative method.
- *The formulation of the research question (foundations)*. The use of the Mixed Method within the research is related to the reflection carried out on the research questions. In fact, the two aspects of the study, the identification of the problem and the consequent formulation of the research questions, have led to investigating the phenomenon in the sequence that from the qualitative moment leads to the quantitative one to finally reach a conclusive interpretation of the phenomenon. The research questions formulated are: what specific connotations do support teachers identify in the UDL system? What connections between UDL and neuroeducational perspectives can promote inclusive environments and contexts?
- *The choice of the methodology of the research process.* The use of the Mixed Method in our research allows us to explore UDL to measure objective aspects and understand and describe subjective elements.
- *The observation of the researcher's behaviour (philosophy)*. Our action within the research is pragmatic, as we are trying to provide a picture of the complexity of the construct underlying the UDL system; we have also tried to answer the research questions formulated, to

achieve the objectives set so as to obtain a final product.

- *The quantitative/qualitative treatment of data.* This final product of the research contains qualitative and quantitative data that provide the most precise possible vision of the overall UDL system.

To plan this investigation, with the Mixed Method, we followed the four phases defined by Creswell in 2009[3] (pp. 206-208): *timing* (synchronization), *weighting*, *mixing*, and *theorizing*.

In the first phase, *Timing (synchronization)*, we defined the times of the qualitative and quantitative data collection, according to the steps of the Sequential Exploratory Design Strategy. In particular, the first two actions were outlined: first a preparatory action, in June 2024, during which the topic of the investigation was defined and the research was contextualized, the questions and the research objectives were formulated; and the second planning action, in September 2024, in which we intervened on the qualitative part of the research, with the administration of the adaptation of the *UDL Reflection Questionnaire*, proposed to 325 future secondary school support teachers of 1st and 2nd grade, attending 2 courses of "Special teaching: metacognitive and cooperative approach" (held by Prof. G. Cappuccio) and 1 course of "Special teaching and learning for sensory disabilities" (held by Prof. G. Compagno), with the aim of identifying the specific connotations of the UDL.

The II phase, *Weighting*, is described by Creswell as the moment in which the researcher gives priority to the qualitative phase or the quantitative phase of his study. For our research, the investigation activities involved, first, a qualitative phase with the administration of the *UDL Reflection Questionnaire* and then a quantitative phase.

As to the III phase, *Mixing*, Creswell defines it as the study of the collected data. In our research, this activity corresponds to the implementation phase. We proceeded with the transcription and analysis of the interviews carried out through clusters, obtaining first categories of elements useful for the definition of the *UDLtest* quantitative questionnaire.

In the IV phase, *Theorizing*, we will start with the first administration of the UDLtest to the 325 future support teachers, which will take place at the end

of May 2025, so we will proceed to start the first validation step of the new quantitative questionnaire.

3.1 The investigation

The Sequential Exploratory Design Strategy was chosen because, as described by several studies, it is the most suitable to succeed in «the exploration of the research problem. This model uses a qualitative approach, in a first phase, to explore the participants' experience of the phenomenon under study, their culture or the values of the group, or the structure of the institution» (Ponce & Pagán-Maldonado, 2015, p. 118). In fact, «the sequential exploratory strategy involves the collection and qualitative analysis of data at the beginning, followed by a second phase of quantitative data collection and analysis. The central focus of the research is placed at the beginning of the process and the data are mixed through the connection between the analysis of qualitative data and the collection of quantitative data» (Creswell, 2009, p. 211).
The survey, following the Sequential Exploratory Design Strategy proposes a process divided into three phases (Creswell & Plano Clark, 2007):

a. Phase 1: Collection and analysis of qualitative data. In this phase the survey concerns the translation and revision of the UDL questionnaire, the choice of the sample, to which the questionnaire was administered (November 2024).
b. Phase 2: Creation of the quantitative instrument drawn up from the analysis of qualitative data. On the basis of the analysis of the data from the *UDL Reflection Questionnaire*, the quantitative instrument *UDLtest* was built, which will be administered in May 2025, after an initial pilot administration carried out in March on a group of 50 master's degree students in Pedagogical Sciences at the University of Palermo, attending classes of Evaluation Science & Lab, with the aim of testing the questionnaire and its reliability.
c. Phase 3: Administration of the quantitative instrument, currently being implemented. We started with the administration of the *UDL Reflection Questionnaire*, to whose results a qualitative analysis was applied. The analysis tool selected is cluster analysis, which involves the identification and grouping of common elements within the

responses (clusters). Each question in the questionnaire may correspond to one or more clusters; these, in the second phase of the model, constitute the items of the closed- ended questionnaire, to whose results a quantitative analysis will be applied, the object of the third phase.

In order to construct the clusters of the answers obtained from the administration of the UDL questionnaire, we first proceeded with the analysis of the first 50 answers to question 6 "Provide options to promote interest. How can I make what I say more interesting?".

The first step was to carefully read the 50 answers provided; subsequently, some key words representing the answers were identified. For the question analysed, the following key words/expressions were identified: group involvement, tics, laboratory activities, direct experience, communication channels, facial expressions, regulation of tone of voice, body language, examples of daily life, class climate, teaching strategies.

The third and fourth steps concern the identification of eight micro-categories of answers, each of which was associated to a colour, and the subsequent organization of the answers within the same micro-categories. The answers were therefore highlighted with different colours based on the micro-categories to which they belong, reported below:

1. emotional involvement of the group;
2. multimedia means;
3. diversified communication channels;
4. laboratory activities;
5. facial expressions and body language;
6. charisma of speech;
7. diversified teaching strategies;
8. classroom climate and setting.

The fifth step concerns the analysis of the micro-categories and the construction of the items: in this sense, the 8 micro-areas have been grouped into 6 macro- categories. These are:

1. Emotional involvement of the group;
2. Use of multimedia materials and innovative teaching technologies;
3. Verbal, paraverbal and non-verbal communication;
4. Use of diversified teaching strategies;
5. Direct experiences in a laboratory setting;
6. Structuring of the setting and climate of the classroom.

The sixth and final step consists of the creation and application of the binary matrix: each item is analysed and associated with one or more of the 6 macro-areas previously identified. When the item falls within a macro-area, it is identified with the code "1", (1) when the item does not correspond to the macro-area, it is identified with the code "0" (2). Some items may belong to more than one macro- area (3).

	ITEM 1	ITEM 2	ITEM 3	ITEM 4	ITEM 5	ITEM 6
ANSWER 1	1	0	1	0	0	0
ANSWER 2	0	1	1	0	0	0
ANSWER 3	1	0	0	0	0	0
ANSWER 4	0	0	1	1	0	0
ANSWER 5	0	0	0	0	1	0
ANSWER 6	0	1	0	1	0	1
ANSWER 7	0	0	1	0	0	0
ANSWER 8	1	1	0	0	1	0
ANSWER 9	0	1	0	0	0	0

Legend: red (1) – blue (2) - green (3)

The cluster analysis conducted on the results of the *UDL Reflection Questionnaire* does not, at this stage, aim to obtain a qualitatively significant result, given the limited sample, rather we focused on the study of the applicability of the method. Cluster analysis is an excellent investigation tool that has allowed us to build the quantitative investigation tool, which is currently being implemented.

Conclusions

The idea of starting from qualitative research has allowed us to remain connected to the paradigms of complexity (multidimensionality of experiences), contextuality (phenomena are decoded considering situational realities) and processuality (investigation data are dependent on the temporal dimension that characterizes the research process) that characterize the UDL as a dynamic multi-level tool.

In short, it can be stated with Denzin and Lincoln (2005) that the research conducted so far is certainly a situated activity, which places the observer in the world, more precisely, the teacher in his operational context, promoting a metacognitive reflection on his teaching practice that does not operate any detachment from his daily action space. It is no coincidence that Coggi (2005, pp. 26-27) states that qualitative research, applied to education in a broad sense, has the aim of "understanding the educational reality investigated and deepening its specificities through the involvement and personal participation of the researcher". In this first part of the research, it emerges that, despite the legislation on the inclusive issue being already widespread in the school context, and accompanied by a proliferation of events and scientific initiatives on the topic, the perception that teachers have of inclusion and their teaching practice exhibits some features of fragmentation, discordances on the conceptual level and gaps in terms of methodological competence. However, an awareness is developing that is not only theoretical (the construct of inclusion, its epistemological presuppositions, the axes of research and study), but also practical, in terms of a change of perspective that leads teachers to rethink their teaching, in function of contexts: the class, the school, the territory, contexts which are increasingly varied and characterised by variability.

Author contributions

Giuseppa Compagno is the author of paragraph 2 and the Conclusions.
Lucia Maniscalco is the author of paragraph 3.
Ilaria Scolaro is the author of the Introduction and paragraph 1.

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