EDUCATIONAL INNOVATION AND EMERGING TECHNOLOGIES IN CARE TEACHING FOR THE TRAINING OF PROFESSIONALS IN THE HEALTH AND MEDICAL FIELDS

INNOVAZIONE EDUCATIVA E TECNOLOGIE EMERGENTI NELLA DIDATTICA DELLA CURA PER LA FORMAZIONE DELLE FIGURE PROFESSIONALI IN AMBITO SANITARIO E MEDICO

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ABSTRACT
University-level health and medical education must integrate technical expertise with pedagogical knowledge to implement a teaching methodology focused on care that is attentive to relational, ethical, communicative, and existential dimensions (Zannini, 2002). Furthermore, the Digital Twin, as a high-definition advanced simulation technology, could serve as an ethical-relational tool for assessing these competencies and fostering a more authentic relationship between practitioner and patient

La formazione universitaria in campo sanitario e medico necessità di integrare competenze tecniche e un sapere pedagogico, per implementare una didattica della cura attenta alle dimensioni relazionale, etica, comunicativa ed esistenziale (Zannini, 2002). Il Digital Twin, come dispositivo tecnologico di simulazione avanzata ad alta definizione, potrebbe rappresentare un *tool* etico-relazionale per verificare queste competenze e promuovere una relazione più autentica tra medico e paziente.

KEYWORDS
Inglese [Pedagogy of care; Didactics of Care; Digital Twin]
Italiano Pedagogia della cura; Didattica della Cura; Digital Twin

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Introduction

University education in the health and medical field, in recent times, is characterized by a perspective that is increasingly centered on the subject as a unique and unrepeatable person and for which the care approach represents an essential path for an authentic and meaningful relationship between the medical or health figure and the patient. This perspective represents a real epistemological turning point for medical pedagogy, which certifies a paradigm shift in training, from a purely technical-clinical approach to a more humanistic one, for which an integration of multidisciplinary and clinical knowledge, relational skills and ethical reflexivity is necessary (Cambi, 2010; Mortari, 2015). A knowledge that is substantiated in the pedagogy of care as a significant orientation of contemporary thought and formative action *just* in which life and relationship are foundational pedagogical categories.

1. For a didactics of care in the health and medical field

For Martin Heidegger (2005, 1999, p. 311), the cure is an ethical-ontological category that embraces the entire existential and relational dimension of the human being; it is the "fundamental structure of being there" of a "being there as keeping us", that is, a way of being in the world to belong to the world and contribute to its development, for which self-awareness and training are required, first on oneself, for the search for an identity, and then to create the best conditions for the self-formation of the other (Mortari, 2009; Cambi, 2010). Franco Cambi defines care as a polysemic category, a set of gestures and actions of stimulation and support aimed at generating these conditions. Care, "being there as well as keeping us" legitimizes the profound meaning of life through authentic relationship, and relationship, through care, is authentic life. A life that is supported by care as a vital force, especially for those who live in a situation of discomfort, as "it creates the conditions for them to somehow rise from that situation and emancipate themselves, (Canevaro et al., 1997). It is no coincidence that Luigina Mortari points out that "care is a way of being in the world that takes responsibility for life (2015, p. 23). A life in which all living beings are intimately connected in a condition of mutual belonging, therefore, in a dimension in which recognizing the other is essential for one's existence, in which to have respect for the other, to feel responsible for the other, to promote the flourishing of the other as a gifting and gratuitous act (Mortari, 2017, pp.98-102). Care is therefore care of oneself, of others and of the world (Boffo, 2006), as it coordinates the dynamics of a subject's relationship with himself, with his fellow human beings and with things. Therefore, care, by definition, is endowed with universality, clears its boundaries and frees itself from the label of value that is practiced, exclusively, in systems such as the

family, or the couple, to invest any social context assuming a political value (Tronto, 2013; Autore, 2015). Care is a value and, at the same time, a set of practices that substantiate the relationship, when it is moved by a reciprocal intentionality of the subjects, oriented to promote a well-being (Mortari, 2009), which requires sensitivity, delicacy, respect, an inclination and a disposition constantly oriented towards the search for mutual good. The relationship thus becomes a space for human formation which, due to the relevance of the subjects within which it is substantiated, requires a semantics where care is an essential dimension for a reciprocal exchange and an interaction that enriches (Bruni, 2008) as well as, as are dignity, as "realization of the necessary conditions for each individual to succeed in his or her human formation", and support, as an accompaniment towards a change or repositioning that, by definition, presupposes the other (Bruni, 2024 p. 230). Care in the relationship requires attention as the "rarest and most authentic form of generosity" towards oneself and towards the other (Weil, 2008) as a preparatory capacity for a responsibility for responding to one's own needs and the needs of the other (Noddings, 2013). Therefore, the authentic relationship is a relationship of care, it is therapeutic and educational action as a place of analysis and transformation (Buber, 1970), just as teaching is, as a moral action, which, precisely because it is above all relationship, is a space for ontological investigation and, even more, an ethical question (Damiano, 2007). As a reparative action, it requires rules for approaching and caring about - when one recognizes a need of the other - for taking care of the other - when one recognizes that something can be done for the other - for caring (care giving) - which implies the satisfaction of the need for care - , for receiving care (care receiving) which restores the sense and meaning of the action of care and certifies whether the need for care has been satisfied (Tronto, 1993). But care is also a rigorous analysis of the reasons and plots of the existence of each subject, intimately connected to each other. When it follows these logics, it becomes a "reflective care, that is, a care as an educational project aimed at the construction of well-being, the result of gazes and gestures sensitive to the whole" (Demozzi, 2017, p.91). And so, in a perspective in which care represents an ideal model of thinking and acting for life (Mortari, 2023), care practices, since explore the formative dynamics of the person and the relationship, they require a careful and inclusive teaching of care (Bruni, 2008). A didactics of care understood as the operational transposition of pedagogical principles and ethical values, such as a series of methods, techniques, strategies, tools and skills coordinated with each other in a pertinent and functional way in order to transform the relationship between doctor and patient into an authentic and meaningful relationship of care. Therefore, if the pedagogy of care defines the meaning and its purposes, the didactics of care identifies a structured repertoire of strategies and a liturgy of gestures and actions to build formative experiences that promote, within a space of incommunicability and conflictuality, a reflective and relational awareness, a

custody and cultivation of the other, through a humanitas that reveals itself with mastery, understood as testimony and competence on the human (Calabretta, 2018) of the educator towards the student, of the doctor towards his patient. A rituality that intervenes to practice care with the awareness that in this process also the experiential experience of those who care also acts, with its intangible heritage, a knowledge that can always be educated that is part of a spirituality oriented to the good, but nevertheless those tensions that are peculiar to educational work. It is, that is, "to understand and work on what care of people is, but also on what it means to have particular experiences of caring for people [...] which implies seeing the educational experience as something that is important to take care of" (Palmieri, 2011, p.37). A way of practising care for people through a didactic of care that means, above all, "taking care of what is established and built in order to take care of them and of those mediations that are put in place in order to introduce, accompany, say goodbye to someone from and into the educational experience (Ibid., p. 38). The training of the professional in the health and medical field requires an integrated approach that knows how to combine the rationality of clinical action with the empathic understanding of those dynamics and humanity that, together, represent the heart of the relationship because the doctor, like any other professional figure, who makes the relationship a topical moment, is above all an educator to life and a promoter of life. The didactics of care is, therefore, a didactic that educates to care through care itself, by means of formative practices that turn out to be experiences of care, because they educate to respect, dignity, to attention, empathy, responsibility. It is a practical knowledge that is declined through a relational, an experiential, a reflective dimension that slowly opens up, even to a technological dimension. Relational in that it is a didactic that favors educational dialogue, reciprocity, comparison and hermeneutical synthesis; experiential, because the relationship becomes a space for formation through a reflective posture; reflective because training, which derives from the relationship, becomes an opportunity for the acquisition of awareness and inner transformation; technological, because it opens up to horizons that prefigure simulated contextsand which, as such, amplify training perspectives and the possibilities of a greater humanization of the relationship between doctor and patient. Within a training accustomed to clinical-scientific practices, promoting a didactic of care means inhabiting care and, to do this, it is necessary to build contexts in which to analyze the ethical and relational sense of acting in the relationship. In this sense and in the perspective of a didactics of care open to technological innovation, high-fidelity simulation (Issemberg et al., 2005; Fanning & Gaba, 2007) can represent a strategy to transpose the principles of a pedagogy of care into didactic action, and an additional stimulus to activate that professional reflexivity thanks to which the figure in training is finally able to problematize his own actions, the choices he makes, to prefigure their effects, and thus learns to structure technical knowledge,

pedagogical, ethical and experiential and to help the patient to develop awareness of the way of "being in care" through a generative support that does not judge but praises and praises.

2. The Digital Twin as an experimental paradigm for health education: pedagogical and ethical implications

Technological innovations in recent years have improved training in all areas, particularly in the medical and health fields, redesigning and re-signifying the methods and formulas of learning and assessment, knowledge and skills. In the medical and health field, the Digital Twin, from now on (DT) represents an experimental paradigm that has the ability to replicate and reproduce the behavior of a subject in real time but in virtual and dynamic mode and in high definition (Grieves, 2014; Fuller et al., 2020). This device is penetrating both medical and health education and school and university education and this happens due to the great technological and pedagogical value (Bruynseels et al., 2018) that is recognized for it, despite having been developed for applications in the engineering field. Representing the patient in a virtual way with all the characteristics that define him in real life, developing a dynamic and interactive environment in which the subject in training can experiment in an increasingly profound way and with greater attention to all the details that are fundamental for a meaningful relationship, becomes an opportunity to be able to integrate clinical data, physiological parameters and behavioral responses. The ecological perspective that is the background to the DT, to the functions and purposes for which it was designed is decisive for transforming this advanced simulation in high definition into a dynamic and interactive digital and virtual ecosystem, which is progressively perfected, returning feedback in real time, as an effect of a learning process and reactions to the actions and stimuli of the subject in training (Fuller et al., 2020). As an augmented reality technological device, DT generates an immersive and profound training experience, fostering the integration between clinical objectivity and communicative, ethical and pedagogical reflection (Cant & Cooper, 2017). The interaction between the digital twin and the professional figure in training is an experience capable of reproducing a clinical and pedagogical comparison in which it is possible to record emotional activity also in response to physiological stimuli, allowing the complexity of the relationship between doctor and patient to be experienced and analyzed. It represents a "different" way of building new connections. After all, one of the functions of the DT is precisely to act as a mediator to accompany the patient to a higher or, if you like, deeper level of the relationship. Otherwise, as Andrea Canevaro argued, "a mediator who does not invite us to reach a next step would not be such, but would become a fetish or turn into a prison"

(2008, pp.8-9). The digital twin, in fact, is capable of simulate the real emotional responses (anxiety, anger, joy) based on the communicative inputs and relational style of the professional figure in training. DT makes visible all those dimensions of care that are not: empathy, the ability to listen, communication, respect, responsibility (Dacety & Jackson, 2004; Kurt, Silverman & Draper, 2016). The possibility of being able to analyze these invisible dimensions and to integrate a series of data of various kinds, which make it possible to objectify aspects that, in the absence of this device, could not be evaluated, represent both the innovative element and the true experimental value of DT. Once all the reactions of the DT to a change in behavior have been recorded, which may concern postures, tone of voice, or simply the communication of some choices or the omission of some of these, it will be possible to create more relationship and communication models, for how many are the digital twins of the patients with whom the professional figure interacts. In this sense, it represents a device capable of minimizing the possibility of making mistakes and, consequently, the risk of generating emotional problems for the real patient. After all, the use of simulation in the medical and health field goes precisely in the direction of increasingly guaranteeing a greater level of reliability and safety of the care relationship between doctor and patient (Gaba, 2004). This interaction represents an interesting space for the pedagogical investigation of the professional figure in training. The relationship between the professional figure in training and the virtual patient, in fact, becomes an opportunity to observe the responses to one's stimuli and communication choices with the patient from whom he/she receives important narrative feedback, for a possible re-elaboration of these decisions, thus highlighting the effectiveness of DT as a powerful transformative learning tool (Mezirow, 2003) that promotes the development of skills and awareness of the level of quality of the relationship and communication between the doctor and the patient. Experimenting with the complexity of the relationship between doctor and patient, favoring a continuous re-elaboration and re-signification of the choices of the professional figure in training, transforms simulation into an experience of professional reflexivity. Therefore, all the different simulations contribute to the construction of his professional identity. Although the opportunity to improve the care relationship between doctor or professional figure in the health sector and patient has now been widely demonstrated, there are still many questions that the pedagogical and medical community are asking, to avoid the risk of reducing care and the care relationship to exclusively technological paradigms. The risk of a technologization of the care relationship is high if we exclude pedagogical knowledge and humanitas at the foundation of a space that, by definition, should be dialogical, confrontational, reflective and transformative in the direction of promoting integral reciprocal, human and professional growth. In this sense, DT anticipates a reality that does not replace but formats, that is, adapts by building the best conditions to

catalyze the formative moment without canceling the human dimension (Floridi, 2014), although some pose ethical dilemmas. The concern lies in the fact that the simulation between a real and a virtual subject can accentuate the risk of reducing human complexity, i.e. not fully representing the person as a unique and unrepeatable being (Bruynseels et al., 2018) or, even worse, of shifting the focus of training to something other than the centrality of care as a relationship (Mortari, 2015). This could become a real problem if technology were used not as a tool to build bridges and generate humanization, but as a source capable of expanding a certain communicative distance that, in many cases, is recorded, between doctor and patient. The introduction of DT in many health facilities, even if on an experimental basis, also aims to reduce that halo of uncertainty about its effectiveness, at least as an evaluation tool. In this sense, the opportunity it offers to accumulate data of various kinds (biometric, behavioral, relational, communicative, emotional) and to exempt oneself from a judgment on the person, allows us to carry out a permanent evaluation of a system that integrates cognitive, affective, relational dimensions. This process, for the subject in training, is transformed into a self-formative moment, of technical knowledge and ethical skills, because it allows one to question one's own values, relational, because it allows one to inhabit the relationship and to educate oneself to proximity and closeness through gestures that are perfected, pedagogical, because it educates to listen, to develop empathy, to suspend judgment, to recognize the other in his or her uniqueness and diversity to open a space for relationship and deep knowledge, reflective, because the professional figure in training, through simulation, develops professional identity, a conscience and awareness located that will serve to act in the relationship with an ethical sense and with educational functions.

3. Humanitas and technology as an integrated paradigm of health education: prospects for future research

The direction that university education in the health and medical field has chosen to take, which integrates pedagogical knowledge and digital innovation for an increasingly better relationship of care between doctor and patient, suggests the need to converge towards an integrated training ecosystem, where humanitas and technology will have the task of promoting more and more humanization in a space that, Until now, it had been predominantly clinical. In this sense, the health education of the future will necessarily have to deal with a pedagogical dimension that cannot disregard values such as care, responsibility, respect, a sense of proximity, attention, but, nevertheless, from a didactic dimension capable of transposing this noble knowledge into a liturgy of gestures, behaviors, strategies and methods. The didactic dimension of care will be fundamental, in fact, in the

integration of the technological dimension to ensure an ecology of learning and training, which is a perspective in which technology dialogues and cooperates with the human dimension, not to crystallize it but to enhance it. In this direction, it is already possible to identify new lines of research on the basis of some questions: is it possible to develop a pedagogy and didactics of care in virtual environments? Which epistemology should be referred to for the high-definition simulation through DT? How can virtual simulation be increasingly made a space in which a hybrid educational ecology is promoted? These are questions that will soon have to provide answers to satisfy the urgency of exploring the principles of a pedagogy of care in interactions mediated by immersive technology and in virtual simulations, and to understand whether, indeed, it is possible to certify a quality pedagogical presence in a virtual space but, nevertheless, to evaluate the ability to educate to care through technological mediation. In the same way, it will be important to understand what kind of knowledge virtual simulation produces through DT, also to encourage the comparison between real relational experience, between doctor and patient, and virtual experience. In other words, it is urgent to explore a territory of analysis that concerns the quality and validity of digital training experiences, by virtue of the delicacy of the object of investigation which is the digital care relationship. Finally, the goal of exploring new training paths to increasingly enhance the processes of learning and transformative training requires the implementation of a pedagogical and didactic investigation that requires the definition of new models capable of keeping up with the demand for innovation and integration of new and increasingly intelligent technologies. The integration between pedagogy and didactics of care and digital innovation through the analysis of the pedagogical and ethical implications of DT opens up new scenarios for health but also school training. The transposition of DT in the school environment could represent a new field of investigation. The high-definition reflective simulation allowed by DT can become, in the future, a model for a didactic of care at school capable of enhancing the experience and the mediated relationship of technology, as factors to elevate humanistic education. Training in the health sector and educating to take care of oneself, of others and of the world is a stimulus that urges pedagogical knowledge to reflect on how to transfer the culture of care into virtual contexts to transform them into ethical and pedagogical ecosystems and, as such, into hybrid spaces with a high level of humanity. The scenario that is configured in university education in the health sector does not exclude the possibility of transferring some technologies to the school environment. The possibility of using DT as a tool in teaching would represent a new frontier to be explored and a new space of pedagogical and didactic investigation that could open new horizons of research to improve didactic action and make it increasingly a space open to dialogue and meaningful relationships, with important transversal implications for all students. In this sense, the application of DT in school teaching would offer the

opportunity to encourage new ways of personalizing learning, especially with students with special educational needs, thus resulting in an extremely inclusive device. Multisensory simulation would allow the structuring of experiences calibrated to the characteristics of the student, so as to identify which factors can enhance his diversity, encourage quality participation in the classroom, the development of a varied repertoire of skills, and a deeper understanding of how he or she experiences the classroom context.

Conclusions

If pedagogical-health research succeeds in giving answers to the above-mentioned questions, health education will be able to have even more scientific connotations and be characterized by relational, reflective, human, digital and ethical knowledge and skills and thus propose itself as an innovative knowledge truly oriented towards the care of life. In addition, DT as an innovative formula of relational mediation could represent a useful tool for educational innovation at school, provided that teacher training is promoted that is extremely calibrated for educational purposes and to transform DT into a powerful tool for inclusive mediation and integral development for all students.

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