

Rosabel Roig-Vila
Fabrizio Manuel Sirignano
(Eds.)

**Miradas
contemporáneas
sobre la
educación:
investigaciones,
experiencias y
reflexiones**

Miradas contemporáneas sobre la educación: investigaciones, experiencias y reflexiones

Rosabel Roig-Vila
y Fabrizio Manuel Sirignano (Eds.)

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Chapter 19. Learning in complexity: perspective of health sciences students after intensive and immersive training program

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Abstract: This chapter presents the results of a qualitative study carried out as part of the European project ECOLAH - Embracing a Complexity-Oriented Learning Approach in Health, which evaluated the health student's perspective an intensive, immersive and co-creation training programme. The programme took place in April 2024 in The Netherlands, involving 46 students and 15 professors from five European countries. The training was structured around four interdependent thematic modules: Complex Adaptive Systems, Futures and Epistemic Literacy, Becoming in Complexity and Holding and Facilitating Environment. Data was collected using questionnaires, written reflections and observations, and analysed using qualitative methodology. The results indicate relevant transformations in the pedagogical development of competences such as empathy, critical thinking, self-reflection, self-care and collaboration. Experiential learning in an immersive environment, combined with the co-creation of content and practices, proved to be a catalyst for future literacy and transformative education. It is concluded that complexity-oriented pedagogical approaches can contribute to the training of health professionals who are more resilient, ethical and prepared to act in uncertain and dynamic contexts.

Keywords: complexity, co-creation, immersive learning, health education, future literacy

1. INTRODUCTION

The growing complexity of global challenges - such as climate change, pandemics, social inequalities, demographic transitions and the overload of health systems - requires a thorough review of current educational models. In the field of health education, there is an urgent need to prepare professionals with not only technical skills, but also with reflective, ethical, collaborative and systemic abilities, capable of acting with discernment and creativity in contexts marked by uncertainty (WHO, 2021). This shift implies abandoning linear and transmissive pedagogical approaches in favour of models that promote complexity-oriented learning, centred on co-creation and immersive experience. Complexity theory, developed by authors such as Edgar Morin and Stuart Kauffman, argues that living systems – including educational and health systems – are dynamic, adaptive, and unpredictable. Education must therefore cease to function as a mecha-

nism of control and standardisation, and instead become an ecosystem of relationships, emergent learning, and multiple ways of knowing (Merali et al. 2011). In this paradigm, the educator becomes a facilitator and co-explorer of knowledge, while students actively construct their learning trajectories. In this context, the notion of co-creation in education is gaining relevance: a process in which educators, students, and, in some cases, external communities actively collaborate in defining the content, methods, environments, and purposes of the educational process (Bovill, 2020). Co-creation breaks with hierarchical logic and transfers epistemological authority to the collective, allowing knowledge to emerge from interaction and mutual listening. Furthermore, immersive learning environments – whether physical or natural – have great potential to foster students’ emotional, cognitive, and sensory engagement. According to (Morgado, 2022), a truly immersive experience occurs when there is simultaneous involvement by the system (the physical and social environment that supports the experience), by the narrative (the symbolic and affective meaning attributed to the process), and by action (the student’s ability to act and transform the situation). These three dimensions become particularly effective in educational processes aimed at personal, relational, and professional transformation (Aguayo et al., 2023). This was the context of the ECOLAH project - Embracing a Complexity-Oriented Learning Approach in Health, funded by the Erasmus+ programme (2022-2024), which aims to transform higher education in health using an integrated approach of complexity, co-creation and experiential learning. The project is organised into four Intellectual Outputs (IOs): IO1: definition of the assumptions and philosophy of Complexity-Oriented Learning (COL) applied to health education; IO2: development of guidelines for training educators in the use of Complexity-Oriented Learning (COL); IO3: preparation of four structuring courses with open resources: *Complex Adaptive Systems (CAS) - to understand health as a dynamic system*; *Futures and Epistemic Literacy (FEL) - to develop anticipatory thinking and future literacy*; *Becoming in Complexity (BIC) - to foster critical thinking, self-evaluation and empathy*; *Holding and Facilitating Environment (HFE) - to create safe, ethical and collaborative relational spaces*; IO4: design and implementation of an intensive international programme for health students.

This study focuses on IO4, an intensive international programme designed as an immersive learning experience in complex contexts, incorporating participatory methodologies, co-creation, and experiential environments. It aims to examine how students perceived and engaged with the programme, and how it shaped their understanding of pedagogical and educational dynamics. Through critical reflection, the study also seeks to contribute to the development of a replicable model of health education in higher education, better aligned with contemporary global demands.

2. METHODS

This qualitative study focuses on analysing the learning intentions and future practices expressed by students following their participation in an intensive, immersive, out-of-classroom training programme based on complexity-oriented learning, held in close contact with nature at the Klonie campsite in Ellertshaar, The Netherlands. Professors’ perspectives were also collected and analyzed but are not included in this study. The training took place over one week in April 2024. It was implemented through a series of thematic workshops, reflective activities, and collaborative dynamics, and organised around four courses within the ECOLAH project.

2.1. Selection of participants

A total of 46 students and 15 lecturers, from 5 different European Higher Education Institutes, from The Netherlands, Finland, Portugal, and Romania, took part in this immersive week. Participants generally applied for the international intensive week on complexity learning in health through their respective higher education institutions. When applications exceeded the number of available places, candidates were interviewed and selected. Promotional materials were developed and disseminated to encourage student applications.

2.2. Data collection

Data collection took place continuously over the five days of the intensive programme, using a multi-method approach to capture the diversity and depth of participants' experiences. Daily online questionnaires were administered (via Google Forms), comprising both closed and open questions. These explored students' perceptions of confidence, the relevance of learning in complexity, and key daily insights. On the final day, students engaged in a structured individual reflection activity, anonymously recording their future learning intentions on post-it notes organised into six reflective categories: *Do more / Do less / Think more / Think less / Care more / Care less*. Simultaneously, the team of facilitators conducted direct and systematic observations of behaviours, interactions and group dynamics, recording qualitative impressions throughout. Finally, spontaneous oral testimonies shared by participants were also considered, contributing to a richer understanding of the formative experiences that emerged during the programme.

3. RESULTS

At the end of the intensive course weeks, the students were encouraged to reflect and propose a question for the following day. These learning questions played an important role in shaping the educators' plans for subsequent sessions. Numerous questions emerged, revealing the participants' deep interest and commitment to finding innovative and integrated solutions for improving health systems and promoting healthy and preventive habits in society. In this part of the questionnaire, students recorded what they had learnt each day during the immersive week. On Tuesday, during the discussions, participants realized that prevention is crucial, but alone it is not enough to solve today's health problems. It was noted that different nationalities have different views on disease prevention, and working together, even in a common language like English, can be challenging. Inclusion and adapting to a constantly evolving world were highlighted as key aspects for improving the health system, which required participants to step out of their comfort zone and focus on educating people about prevention, considering the individual. The different cultures and backgrounds of the participants brought diverse ideas and solutions, although sometimes contradictory, but essential for dealing with the complexity of health problems. This diversity of perspectives showed the importance of collaboration and effective communication between multidisciplinary teams, highlighting that future health challenges can only be tackled through teamwork. Participants concluded that collaboration and effective communication between multidisciplinary teams are essential to meet the challenges ahead. Teamwork, resilience, and empathy were key qualities highlighted. It was an enriching

experience, showing that even with different approaches and systems, the goals and dreams regarding health are similar. The importance of a holistic approach, which includes prevention and continuous care, was a central theme discussed, reinforcing the need to prepare for an uncertain and complex future in healthcare. Notably, many students expressed that this experience transformed their understanding of health, not only as a scientific discipline, but as a social, ethical, and human endeavour, in which personal attitudes and systemic thinking are indispensable. In Wednesday's responses, participants shared several key reflections on learning in complexity. They recognised the importance of applying their personal qualities within complex systems and acknowledged that diversity of perspective is essential. They also explored how the suppression of certain senses can heighten others, influencing their perception of complex systems. This experience allowed participants to explore the challenges of ambiguity in a sensory and emotional way, creating space for more open and non-linear interpretations of the surrounding reality. The significance of communication through emotion and the value of collaboration and division of labour in group settings were emphasised. Participants frequently reflected on the interconnectedness between individuals and their environment, and on the importance of diversity and adaptability in understanding and responding to complex systems. These insights highlighted the interdependence of systems and the crucial role of collective effort and appreciation of diverse individual skills. The conclusions about learning in complexity were varied among participants at the end of Thursday. They recognised the importance of drawing on all available stimuli and engaging in self-development to address and understand complexity and its impact on learning. The value of embracing diversity and adaptive strategies in complex learning environments was highlighted. Participants reflected on themselves and how they might apply what they had learnt in future contexts, particularly in storytelling, communication, and understanding. They explored the role of group anxiety, recognising it as central to their experience, and reflected on the complexity of life and its transformation into meaningful narratives. The importance of addressing one's emotions in the learning process was emphasised, as was the need to seek positive perspectives and avoid pessimism when shaping future actions. These reflections underscore the diversity of participants' experiences and insights, highlighting self-awareness, reflection, and adaptation in complex environments.

Participation in an intensive educational programme may have directly influenced participants' perceptions of their confidence in, and the importance they attach to, learning in complexity. To explore this, students were asked to rate both their confidence and the importance of learning in complexity on a scale from 1 to 5, from Tuesday to Thursday during the ECOLAH pilot intensive programme. At the beginning of the week, participants tended to report moderate confidence (54.3 per cent scoring 3) but high importance (54.3 per cent scoring 4), indicating that while they saw learning complexity as significant, they felt less confident about engaging with it. Confidence and perceived importance increased as the week progressed, and participants became more familiar with the content and approaches. High and very high confidence (scores 4 and 5) rose from 73.5 per cent on Wednesday to 85.7 per cent on Thursday. However, high and very high importance (scores 4 and 5) slightly decreased from 85.3 per cent on Wednesday to 85.7 per cent on Thursday. However, high and very high importance (scores 4 and 5) slightly decreased from 85.3 per cent on Wednesday to 76.2 per cent on Thursday. These

daily variations may reflect not only the progression of the programme but also the impact of specific activities, teaching methods, or social dynamics throughout the week. In summary, participation in the one-week face-to-face ECOLAH intensive programme catalyzed an overall increase in participants' confidence and the importance they attached to learning in complexity, although individual perceptions fluctuated in response to contextual and emotional factors.

Comments from participants highlighted the value of including a greater variety of activities, particularly outdoor and team-building exercises, to foster a more collaborative and inclusive environment. In addition, there was feedback regarding the need for a stronger theoretical foundation for activities and more time dedicated to individual learning concerns. Issues of inclusion and overcoming language barriers were also identified as priorities for future improvement. Finally, many participants expressed gratitude and appreciation for the ECOLAH project and the transformative experience it provided.

In the final learning activity, students were invited to engage in individual reflection, articulating their intentions and attitudes for future learning processes. Using post-its, they recorded their thoughts across six dimensions: *Do more, Do less, Think more, Think less, Care more* and *Care less*.

About *do less*, the students shared a range of concerns and challenges they encounter in their daily lives, including stress, procrastination, excessive use of technology, and unhealthy habits. These concerns reflect the complexity and pressures that many young people experience in both their academic and personal journeys. In relation *think less* Several unproductive thoughts were identified that hinder the ability to face complex challenges. The students recognised the need to reduce negative and unhelpful thinking, focusing instead on more constructive aspects of their personal and professional development. A key area highlighted was the desire to think less about the opinions and behaviours of others, placing greater emphasis on following their own path without judgement. Additionally, they expressed a wish to reduce anxiety about mistakes and external expectations, recognising that these can constrain creativity and progress. Students also aimed to shift attention away from irrelevant concerns, unrealistic scenarios, and unhelpful stressors, focusing instead on solutions and opportunities. They acknowledged the importance of empathy and of developing the capacity to manage complex situations, viewing these as vital to becoming effective and successful professionals. Regarding *care less*, the students indicated a wish to care less about the opinions and behaviours of others, recognising that excessive concern with external judgement can impede their growth. They aimed to focus only on constructive criticism and to let go of anxieties linked to unhelpful or irrelevant feedback. Many students highlighted the importance of concentrating on the present and on matters within their control, rather than on the expectations of others or on issues beyond their influence. There was also a common intention to care less about superficial matters or things with little long-term significance, and to avoid dwelling on the past or letting fear of failure—often linked to high personal standards—block their development.

About *do more*, the students outlined a broad set of aspirations designed to strengthen their capacity to address the challenges of complex life situations. They recognised the need for continual adaptation and growth, proposing concrete actions to support this. A key priority was the pursuit of education and lifelong learning, reflecting their understanding that knowledge

is essential for tackling future challenges. They also emphasised the importance of caring for their physical and mental health, through practices such as regular exercise, meditation, and a balanced diet, to build resilience and sustain energy. Their willingness to step outside their comfort zone illustrates a growth mindset that values conscious risk-taking, personal achievement, and a commitment to a more equitable and sustainable future for all. In professional contexts, students expressed a commitment to continuous improvement and collaboration, aiming to excel in their careers and contribute meaningfully to their fields. Participants highlighted the significance of continuous learning and adaptability in addressing complex health challenges. They stressed the need for open-mindedness, emotional intelligence, and collaborative problem-solving skills. Embracing diverse perspectives and fostering resilience were seen as crucial for navigating uncertainty. Moreover, they acknowledged the importance of ethical considerations and maintaining empathy in healthcare practice. They also recognised the importance of nurturing interpersonal relationships, achieving work-life balance, and prioritizing self-care, all of which are key to overall well-being.

About the category think more, the students' reflections underscored the value of a balanced approach that supports personal and professional well-being, alongside a deeper awareness of how their actions affect the wider world. Many emphasised the need to invest in a healthy lifestyle, including sport, personal time and good sleeping habits, recognising that balance between body and mind is essential for developing resilience and clarity in decision-making in complex and demanding contexts. There was a strong interest in making education more relevant to real-life contexts, particularly within STEAM (Science, Technology, Engineering, Arts and Mathematics), by finding practical and meaningful ways to apply these concepts to solving real-world problems. Health promotion and disease prevention also emerged as central concerns, with students eager to explore strategies for encouraging mental health care, healthy habits, and lifestyle education within their generation. Additionally, they reflected on their future roles as healthcare professionals, focusing on improving communication, empathy, and responsiveness to individual needs, and on promoting a multidisciplinary approach to addressing complex health challenges. They expressed a desire to pursue personal and professional growth opportunities, collaborate with others, and make a positive and lasting contribution to society.

In the dimension care more, the students expressed a range of concerns and aspirations regarding caring for themselves and others, and how this relates to their ability to address complex life challenges. Their reflections highlighted the importance of a holistic approach to well-being, encompassing physical, mental, and emotional dimensions, as well as a broader awareness of their impact on the world around them. One key area of focus was the healthcare system and the role they could play in improving it. Students recognised the importance of attention to detail and a continuous search for ways to enhance the quality of care provided to patients. They expressed a commitment to deepening their knowledge of different pathologies and engaging in practices that promote prevention and well-being within the healthcare system. In addition, students showed concern for the well-being of others and acknowledged the need to be more attentive to the feelings and needs of those around them. They understood that this requires empathetic communication and a deeper understanding of each individual's experiences. Regarding self-care, students are committed to paying greater attention to their diet and overall lifestyle.

They recognised the importance of adopting healthy habits to prevent disease and lead fulfilling lives. This includes prioritizing mental health, recognizing one's own limits and seeking support whenever necessary, promoting a more conscious and proactive attitude towards caring for oneself and others. Furthermore, students emphasised the importance of staying informed and engaged with the world, avoiding isolation within a narrow perspective. They expressed a desire to learn more about global issues such as climate change, different cultures, and planetary health, and how these can affect people in diverse communities and environments.

4. DISCUSSION

The qualitative analysis indicates that the combination of co-creation, complexity, and immersion profoundly influenced participants' perceptions, values, and intentions regarding their professional training. The intensive ECOLAH programme created a multisensory and relationally rich learning environment, promoting transformations that transcended the cognitive domain, reaching ethical, emotional, and social dimensions. Inspired by the model of immersive environments sustained by system, narrative and agency (Morgado, 2022), the pedagogical design allowed students to experience complexity in an active and embodied way. Elements such as the natural environment, the demanding themes of the four modules (CAS, FEL, BIC, HFE) and the freedom to choose, experiment and reflect were crucial in fostering critical thinking, self-regulation and conscious action. These results echo the findings on collaborative immersive experiences in health conducted in virtual environments: collective immersion reinforces motivation, emotional engagement, and sense of presence (Paulsen et al., 2024; Zarei et al., 2023). Co-creation, evident in the design of activities and especially in the reflection of do/think/care more/less, acted as a catalyst for transformative learning. (Bovill, 2020) highlights that student involvement in collective co-creation reinforces a sense of belonging, autonomy, and commitment. (Pineo et al., 2021) showed similar results in health learning: co-creation strengthens the reconstruction of the professional role and systemic thinking. The world clouds revealed terms such as empathy, growth, purpose, and listening, as opposed to anxiety, procrastination, and conformism. This points to an intentional movement of personal and collective transformation, aligned with transformative education and regenerative education. Structured reflection via post-its notes provided a moment of metacognition and self-regulation, facilitating the emergence of genuine internal patterns, from commitments to personal well-being to social and environmental responsibilities (Cribb et al., 2017). Oral testimonies and observations by facilitators indicated that participants valued emotional safety, openness to error, and genuine collaboration – elements recognised review of immersive learning environments as essential for meaningful learning. These criteria also appear in studies on Living Labs in health (Heimburg & Cluley, 2021), which highlight the importance of context-sensitive co-creative spaces. Despite limitations—small number of participants, short duration, and cultural diversity—the results suggest that the ECOLAH model is replicable and adaptable. The creation of living learning ecosystems, co-created with students, teachers, and communities, which embrace uncertainty as a formative element, represents the way forward. This is in line with recent studies on innovation in higher education and methodologies such as co-creative gamification (Gkogkidis & Dacre, 2021) and the design of collaborative virtual environments that promote critical

thinking (Stretton et al., 2025). In short, the articulation between complexity, immersion and co-creation has proven effective in cultivating more resilient, critical, ethical and collaborative health professionals, prepared to work in complex and dynamic contexts.

5. CONCLUSION

This qualitative study demonstrated that complexity-oriented learning, when applied in an intensive and immersive context such as the ECOLAH programme, significantly influences how students in health perceive and integrate teaching–learning processes. Through participatory and reflective methodologies, students enrolled developed systemic thinking, empathy, self-reflection, and future literacy. It can also be concluded that the integration of complexity, immersion, and co-creation offers a promising pathway for the regeneration of health education, in line with the contemporary needs of a rapidly changing world. The ECOLAH project has proven to be effective and replicable, offering valuable insights into how health education can be reshaped to promote a more adaptive, collaborative, and complexity-centred approach to living systems.

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