

**PRINCIPLES OF COMPLEXITY THEORY FOR THE IMPLEMENTATION OF
DISTANCE LEARNING COURSES IN HIGHER EDUCATION**

***PRINCÍPIOS DA TEORIA DA COMPLEXIDADE PARA A IMPLANTAÇÃO DE
CURSOS À DISTÂNCIA NO ENSINO SUPERIOR***

***PRINCIPIOS DE LA TEORÍA DE LA COMPLEJIDAD PARA LA IMPLEMENTACIÓN
DE CURSOS A DISTANCIA EN LA EDUCACIÓN SUPERIOR***

Ronaldo Figueiredo VENAS¹
Lanara Guimarães de SOUZA²

ABSTRACT: This article discusses the complexity in the field of implementing distance learning courses as a possibility of understanding and forms of organization. The research was oriented towards identifying scenarios of uncertainty and unpredictability in the implementation of a distance education course project, using complexity principles, based on Edgard Morin's theory. It seeks to demonstrate the challenges of the process, through the analysis of the experience of the distance education degree course in Pedagogy at UFBA. The study was carried out based on the descriptive-analytical methodology, and using the content analysis technique. It is concluded that the implementation of undergraduate courses in teacher education in distance education is a complex, unstable and unpredictable phenomenon, and that, therefore, must be treated under the aegis of this reality.

KEYWORDS: Course implementation. Uncertainty scenarios. Unpredictability. Complexity principles. Course Project.

RESUMO: Este artigo discute a complexidade no campo da implementação de cursos de licenciatura à distância enquanto possibilidade de compreensão e formas de organização. A pesquisa foi orientada a partir de cenários de incerteza e imprevisibilidades na implantação de um projeto de curso EaD, utilizando princípios de complexidade, baseados na teoria de Edgard Morin. Busca-se demonstrar os desafios e os processos, por meio da análise da experiência do curso de licenciatura em Pedagogia à distância da UFBA. O estudo foi realizado com base na metodologia descritivo-analítica, tendo como técnica a análise de conteúdo. Conclui-se que a implementação de cursos de graduação na formação docente em EaD é um fenômeno complexo, instável e imprevisível, e que, portanto, deve ser tratado sob a égide desta realidade.

PALAVRAS-CHAVE: Implementação de curso. Cenários de incerteza. Imprevisibilidade. Princípios da complexidade. Projeto de curso.

¹ Federal University of Bahia (UFBA), Salvador – BA – Brazil. Research Professor at the Department of Education. PhD in Education (UFBA). ORCID: <https://orcid.org/0000-0002-6319-7985>. E-mail: rvenas@ufba.br

² Federal University of Bahia (UFBA), Salvador – BA – Brazil. Research Professor at the Department of Education. PhD in Education (UFBA). ORCID: <https://orcid.org/0000-0001-7533-8514>. E-mail: lanara@ufba.br

RESUMEN: Este artículo discute la complejidad en el campo de la implementación de cursos a distancia como posibilidad de comprensión y formas de organización. La investigación se orientó a identificar escenarios de incertidumbre e imprevisibilidad en la implementación de un proyecto de curso de educación a distancia, utilizando principios de complejidad, basados en la teoría de Edgard Morin. Busca evidenciar los desafíos del proceso, a través del análisis de la experiencia de la carrera a distancia en Pedagogía de la UFBA. El estudio se realizó con base en la metodología descriptivo-analítica, y utilizando la técnica de análisis de contenido. Se concluye que la implementación de carreras de grado en formación docente en la educación a distancia es un fenómeno complejo, inestable e impredecible, y que, por tanto, debe ser tratado bajo la égida de esta realidad.

PALABRAS CLAVE: Implementación del curso. Escenarios de incertidumbre. Imprevisibilidad. Principios de complejidad. Proyecto de curso.

Introduction

The implementation of the Pedagogy course project in the distance learning modality - DL, at the Federal University of Bahia, in 2017, revealed itself as an opportunity to build strategies for new educational experiences amidst a scenario of economic instability, the increase of negationism and attacks on science, institutions and democracy in Brazil.

Facing this reality involves adopting course designs with an integrated, multifaceted, constructivist and chaotic approach; in contrast to the traditional formal university environment, where learning is linear, standardized and controlled, whether online or face-to-face. For the 'network generation', the real audience of higher education, learning should be non-linear, unstructured and can be well explained by the principles of complexity theory. This paper discusses how to understand the unpredictability and complexity that already surrounds the online learning environment, to overcome a mechanical, non-critical and non-analytical formative proposal of the holographic reality that surrounds us.

The initial elements of complexity theory are briefly described and its relevance for the implementation of DL courses is highlighted when thinking about a training based on interdependence, cooperation and social awareness. Furthermore, it is taken as a premise that the world around us is irreducibly complex and not something determined, predictable or completely controllable. The challenge for teachers is therefore not only to identify the simple elements that underlie reality, but to go beyond and study the complexity in the teaching phenomenon itself. We problematize: How do we propose a course that sees a world that breaks with simple models of cause and effect, linear predictability, and standardization?

Based on Morin (2020, p. 16, our translation), this author tensions such models and states that:

That is why, throughout thirty years of work, I have elaborated, from concepts already formulated but underused and underestimated, if not ignored, a method to articulate knowledge to each other and make it complementary. The method intends to apprehend complexity, not completeness, for we are condemned to incompleteness. Complex knowledge cannot, within itself, eliminate uncertainty, insufficiency, the unfinished. But it has the merit of recognizing the uncertainty, the insufficiency, the unfinished of our knowledge.

Since 1977, Edgar Morin has established the 'Paradigm of Complexity', which allows the development of modeling exercises for phenomena that we perceive as complex. Morin's (2020) basic view of the nature of things is that complexity is organizing and, recursively, organizing. Complexity thinking is made up of an information theory, a cybernetic theory, and a system theory. These three theories contribute to the conceptual development of the idea of self-organization, which, in turn, underlies formative practices in distance education courses (MORIN, 2020).

In this article, we will deal with the initial principles that structure and ground the Complexity Theory in the implementation of a distance learning Pedagogy course in a public university, located in the northeastern region of the country. This process started with the processing of the course process in the internal instances of the institution, going through the curricular structuring, until reaching the finalization of the pedagogical project; this trajectory was experienced amidst a scenario of uncertainties.

Methodological Procedures

The study was conducted in a qualitative approach, based on the descriptive-analytical methodology, which is developed from the systematic and critical description of the characteristics of certain populations or phenomena. According to Prodanov and Freitas (2013, p. 52, our translation), descriptive-analytic research:

[...] observes, registers, analyzes and organizes data, without manipulating them, that is, without interference from the researcher. It seeks to discover the frequency with which a fact occurs, its nature, characteristics, causes, relationships with other facts. Thus, to collect such data, specific techniques are used, among which we highlight [...] observation.

In this sense, the systematic observation occurred throughout the DL degree course in Pedagogy, of the School of Education - FACED, of the Federal University of Bahia - UFBA, under the *Universidade Aberta do Brasil* Program - UAB, which had its first class completed

in December 2021. Also used as a documental source of research were the common technical files in the implementation of an undergraduate course, such as: the mandatory legislation, edicts, terms of commitment and the course project itself. The study used thematic topics inspired by Bardin's content analysis (2016), which is structured in three stages: pre-analysis, initial exploration, and treatment of results and interpretations.

In the first stage, we identified the documents to be analyzed, considering the relationship of each of them with the topic under study. Next, the material exploration stage occurred, where the parts of the documents that dealt with the problematizing clipping of the study were mapped and identified. Thus, as defined by Bardin (2016), in the third stage we carried out the treatment of the results obtained and interpretation, based on the categories of analysis: scenarios of uncertainty and unpredictability, considering the manifest content and its relationship with Edgar Morin's complexity theory.

According to Bardin (2016, p. 43, our translation), document analysis "aims to take into account the totality of a 'text', passing it through the sieve of classification and census, according to the frequency of presence (or absence) of items of meaning (sic)". Thus, it is necessary to focus on understanding what was recorded in the documents, aiming to understand the real context of that situation and its variables.

The Unpredictability in the Implementation of the Pedagogical Project of the Distance Learning Pedagogy Course

Whenever a university proposes to implement a new course, with a new pedagogical project, it has the opportunity to reaffirm its political and ethical positioning to practices that contribute to the non-negotiable defense of democracy, science and human rights. The Pedagogy project analyzed in this article was pioneering as an undergraduate course in the distance learning modality at FAGED, with the development of actions that emphasized the emancipation of the subject, in order to contribute to a more human and more sensitive education project. The reality where this project was conceived is the stage for studies and debates about alternative ways of conceiving the unpredictability of the world, and about behavioral phenomena inexplicable by any conventional analysis.

The project funded by the Coordination for the Support of Higher-Level Personnel (CAPES) and executed by the *Universidade Aberta do Brasil* (UAB) had its first record in edict 10/2017 of the Superintendence of Distance Education (SEAD) of the UFBA. In this document, it is recorded that the selection process offered 500 vacancies, distributed in eight poles/UAB,

in the cities of: Ipirá, Vitória da Conquista, Santo Amaro, Sapeaçu, São Francisco do Conde, Euclides da Cunha, Teodoro Sampaio and Bom Jesus da Lapa.

The internalization of undergraduate courses was an imperative of CAPES/UAB for the acceptance of the project. Thus, the operation of the course would occur under university management, financed by CAPES in partnership with the UAB centers in the previously indicated municipalities. We observe here the coming together of different institutions with their respective organizational systems, each one with its own complexity and constant adaptation to its environment. The integration and interaction between the individuals acting in the different institutions demanded a responsive and adaptive process of interrelationship, even though the attributions and spaces of decision-making power were previously agreed upon. All the systems and each of them were responsible for the course's progress, according to the terms of commitment signed at the time.

The selection process exemplifies this inter-relationship, as it complied with the internal regulations that already determined the percentage of vacancies for quota holders and the CAPES/UAB determinations for practicing teachers, in addition to the vacancies for open competition. The result of the selection indicated an approval of 550 candidates, higher than the number of vacancies, demonstrating the lack of undergraduate courses outside the large capitals and the search for this modality in the interior of Bahia.

As Morin (2013, p. 55, our translation) tells us, "the greatest contribution of the 20th century in the field of knowledge was the notion of the limits of our knowledge. Uncertainty is where we move, not only in action, but also in knowledge". Such uncertainty was present in the data presented as a result of the selection and consequent enrollment process that took place from 11/22/2017 to 11/27/2017. The course management team realized the diversity that would make up the student body, facing something new for the university in the absence of all the answers to the concerns about how to implement a unique course, strongly mediated by the networked digital medium. Thus, the project could not be a replica of the face-to-face Pedagogy course project.

The management group discussed the principles necessary for initial teacher training, but now understood on other bases. The pedagogical project was anchored in resolution 02/2015 (BRAZIL, 2015) for its elaboration, allowing an updated, sensitive and human reading of the training and contextualized with our time. The proposed learning took place in the social sphere, designed to go beyond the information given, to adopt a critical attitude, to evaluate, to have metacognitive awareness and problem-solving skills.

We agree with Cararo *et al.* (2021, p. 2412, our translation), because

[...] complex thinking brings greater clarity to the educational reality, which not only involves rationality, logic, and fragmentation, but also a broader dimension of the human condition itself, through sensitivity, emotion, intuition, and excitement.

The graduates, in addition to being recognized in their differences and diversity, should have the ability to think autonomously and make informed judgments. The new resolution brought into the debate the discussion of the themes of ethno-racial, gender, diversity, and environment, among others, which were already present in higher education institutions, in social movements and in associations such as the National Association for the Training of Education Professionals (ANFOPE) and the National Forum of Directors of Colleges, Education Centers or equivalent from Brazilian Public Universities (FORUMDIR), among others that longed for changes in the training processes.

In this way, we agree with the considerations that thought the meaning given to the curriculum and teacher training policies present in the text of Resolution CNE/CP nº. 02/2015 (BRAZIL, 2015, p. 2, our translation), especially the understanding of curriculum, which says:

[...] the curriculum as a set of values conducive to the production and socialization of meanings in the social space and that contributes to the construction of the socio-cultural identity of the student, the rights and duties of the citizen, respect for the common good and democracy, formal and non-formal educational practices, and orientation to work.

The curriculum announced by this Resolution, which is committed to the social role of the teacher, was necessary for us to think about a curricular proposal for the DL Pedagogy course that would be implemented. In this perspective, we cannot lose sight of the possibilities of a curriculum that promotes a greater articulation between initial training and basic education, in which the pedagogue is better prepared to act in society and face the challenges of unpredictability, but we understand that we also need a professional focused on principles of solidarity and committed to a human and integral formation. Thus,

The philosophical idea of formation cultivated here is in the direction of an ethical-political gesture woven into the curriculum, conceived as a cultural experience. Formation is configured, therefore, by symbolic choices. This, it is necessary to emphasize, is a set of curricular and formational guidelines that the school can experiment as possibilities of qualifying its political protagonism (MACEDO, 2018, p. 1315, our translation).

We agree with Macedo (2018), because we need to think the society in which we live in its totality and complexity. We need to understand the clashes around the divergence of ideas of current issues in education, because the urgency of discussion of such thematic content

brought in resolution 02/2015 (BRAZIL, 2015) imposes a position that cannot stay only in the prescribed, so it is necessary to expand the concept of training.

According to Alves, Venas and Soares (2021, p. 1469, our translation):

[...] the idea of expanding the concept of formation that is implied and imbricated in the experience of culture, contemplated in social relations, forged in the complex pedagogical and political network of decision making, with certain projects that clash when it decides not to adapt to meet the logic of the market, but that needs to meet the context of the real.

We understand, therefore, like Alves, Venas and Soares (2021) and Macedo (2018), the importance of seeking to broaden the concept of teacher training in higher education as a way to imagine a possible future, from the impossible. To desire a more just, solidary, human, and sensitive society. These are the principles that seek the project of the EaD Pedagogy course and that we seek to put into practice.

Scenarios of uncertainty as challenge and potentiality

We understand here the real as Morin and Viveret (2013, p. 77): "[...] the real, is not that which seems stable. To be realistic, what a utopia! It is necessary to be open to the uncertain, to the unexpected. We have to be sensitive to the weak, to the event that surprises us; we have to be ready to tirelessly rethink the state of the world". In this perspective, the project of the EaD Pedagogy course, in the item of the total workload, was rethought in terms of the curricular components to the reality of distance education.

The Distance Learning Pedagogy Course at the Federal University of Bahia was adapted to meet the curricular guidelines established by the Resolutions of the Full Council of the National Education Council, and by the current legislation, in this way, the course has a total workload of 3.583 [...] hours, being that 2.567 [...] hours for structured formative activities, 408 [...] hours of Practice as a Curricular Component, 408 [...] hours for Curricular Internship activities and 200 [...] hours for theoretical-practical activities of deepening in specific areas of student interest (Complementary Activities) (UFBA, 2017, p. 30, our translation).

The structure of the course followed the legal bases and internal regulations of the institution, which allowed the approval on 05/23/2017 of a pedagogical project based on democratic, ethical, human principles and focused on a training committed to the society in which we live; its inaugural class occurred on December 3, 2017. This is proven initially with the implementation of the collegiate as an advisory and deliberative body that began to monitor the actions developed. According to Morin and Viveret (2013, p. 58, our translation), "[...] to

prepare for this uncertain world does not mean to resign oneself. It is necessary, on the contrary, to commit oneself to thinking well, to elaborate strategies, to make bets in full awareness".

The strategies adopted along the formative path were not only with the graduates, but also with the purpose of contributing to the formation of the teaching staff, since the experience was new to the University itself, and few professors had knowledge about DL at that time. For Morin and Viveret (2013), to think well means to be aware of our knowledge and try our best to expand it, but when we do that, we also expand the limits of what we ignore; this is how we move in action. For the authors, this is understood from two principles.

First principle: every action, once launched, enters a game of interactions and feedbacks in the environment in which it takes place, and this game can deviate it from its ends and even lead to an opposite result to the one expected. Second principle: The ultimate consequences of action are unpredictable. The effects of the action depend not only on the actor's intentions, but also on the conditions of the environment in which it takes place. However, it is not possible to contemplate the totality of the inter-relationships in a complex environment such as the social-historical environment (MORIN; VIVERET, 2013, p. 43, our translation).

We agree with the principles put forth by the author, for the action, once triggered, enters into interaction with the environment; and the historical, economic, and political factors may modify the plan. The planned makes sense in theory and expands its meaning in execution, where it will show its limits and the need for changes, adaptations, and the creation of new strategies. In this interval between what we know and what we don't know, new ways of doing action emerge.

The strategy is opposed to the program, it establishes, like the program, an objective and hypotheses for action, but, unlike the program, it modifies its action according to the information gathered and chance. It carries within it the awareness of the uncertainty that it will encounter, and for this very reason it involves a gamble (MORIN; VIVERET, 2013, p. 22, our translation).

This reflection of Morin and Viveret (2013) can be observed in the implementation of the course project. It was structured in the hybrid model, with curricular components developed in MOODLE as a virtual learning environment - VLE and face-to-face meetings at the poles with professors and tutors for classes, to answer questions and for assessments; however, in addition to classes, also for welcoming and sensitive listening to students. This moment allowed a closer relationship between the course management, the staff and the students.

According to Mattar (2010, apud ROCHA; SANTOS, 2021, p. 2720, our translation):

Distance Learning in Brazil is still conceived, in general, based on the premises of classroom education, with restricted and inadequate use of available technologies and media. For him, it is still common for institutions to sell interactivity and deliver courses based on face-to-face education and only taught at a distance, by means of videos. The leader also warns about a chronic problem in this scenario: the training of teachers who work in DL.

When we take a critical look back at the development of the course, we can clearly see the scenario of uncertainties that we had during the last four years. On the financial side, the course was maintained with scholarships for the payment of professors, tutors, and the cost of running expenses, such as per diems and tickets. Besides this, the COVID-19 pandemic generated a rupture in the processes in March/2020, imposing changes in the planning. Thus, the planned project had to suffer changes and adaptations along the way due to constant financial cuts and the health pandemic.

The changes, however, were not thought of as "patches" or "improvisations," but as strategies that would guarantee the improvement of learning in the face of the constantly changing scenario, "[...] creating a dialogic that is both contradictory and cooperative: order/disorder/interaction/organization" (MORIN, 2021, p. 37, our translation). Thus, the uncertainties of the political and economic context required us to be attentive to quality, as a goal we wished to achieve.

[...] We emphasize that quality is a dynamic concept, always the product of a culture and, therefore, related to the historical context. The way we define it at the present moment and perceive its dimensions may be different in the future, due to the new urgencies that will arise. Thus, other aspects may be covered in the discussion about quality in DL (GARCIA; SILVA, 2020, p. 985, our translation).

Thus, the initial training project went far beyond the proposed goal, because uncertainties crossed the plan, requiring a collective and solidary construction work that contributed to a political reflection of our time, in which it is possible to carry out teacher training in adverse scenarios as a way to resist barbarism and the dismantling of the University as we know it.

Final remarks

Considering the analyzed example here, of the implementation of a DL undergraduate course at a public university, we observe that the scenario of uncertainty and unpredictability not only accompanies this implementation, but can become allies of the formative processes that are intended to be emancipating and humanized.

As a dynamic system, the construction of the project in its technical and pedagogical aspects constantly changed itself and the environment in which it was inserted. Although not always open, the system adopted for its creation sought interaction among the participating institutions, exchanging experiences, knowledge and services in a process of self-regulation, development and adaptation.

We noticed that the procedures adopted were able to generate feedback and information that helped in the evaluation and monitoring of the course progress, from the selection to the classes, in order to guide it to a more effective performance. However, we consider the feedback used to be incipient, due to the lack of the recursive element, that is, the lack of a greater connection between the agents of the institutions involved due to bilateral and exclusive relationships.

We conclude that the key for complexity to be understood and considered in DL course implementation processes is internal diversity, which implies heterogeneity, networked processes that drive more horizontal interactions, generating even more heterogeneity. Although we can predict that certain types of events or ideas may arise, we cannot predict their specific content or outcome, unless they are multiple, plural and therefore diverse.

The path is one of transitions to new forms of implementation and organization, which break with the falsely safe and harmonious closed system, for the assumption of non-linear ways of systemic work, which, although they seem catastrophic to us, are better prepared to deal with emergency and unpredictability. We thus emphasize the importance of the quality of the relationships and connections between the institutions involved in the implementation of a DL course, that is, the agents of the system, to ensure a learner-centered, emergent and connected training.

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