3rd WCPE World Conference on Physics Education
Hanoi, Vietnam, 13 - 17 December 2021
3RD WORLD CONFERENCE ON PHYSICS EDUCATION
Innovating physics education: From research to practice

Physics problems directed to biology: a contribution to the initial teacher education through the complexity in problems proposed by Halliday volume II

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This summary presents a qualitative research that was applied in an undergraduate course in Biology at a Public University of Paraná, through a sequence of classes, which identified how complex relationships were built and their influence on the learning process. For that, we used the book "Fundamentos de Física", by the authors Halliday, Resnick and Walker. The methodology used was the Grounded Theory. The essential results that the construction of complex relationships and the resolution of these problems are based on three indicators: research, teacher education and historical appreciation, contributing directly to the theory of complex problems.

1 Typing area

This study presents a qualitative research whose central theme addresses the theory of solving complex physics problems, based on the complexity of Edgar Morin and the definition of poorly structured problems by David Jonassen, linked to the initial training process of the biological sciences teacher. The research was developed in the context of the discipline of Interdisciplinary Projects V, which is part of the syllabus of the undergraduate course in Biology and has a proposal for scientific and technological literacy for students.

The course was chosen after a detailed analysis of the four volumes of the textbook used in undergraduate Physics, entitled "Fundamentals of Physics" by the authors Halliday, Resnick and Walker. After the analysis, it was found that there were several complex problems that could be explored during the undergraduate course in Biology, allowing future professors a broader view, not only of physics, but also of several other concepts. Volume II contains a wider range of complex issues in Physics linked to Biology, questions about gravitation, waves and thermodynamics.

Therefore, this book was chosen to extract and analyze complex problems. In this context, we understand that complexity "is what is woven together" (MORIN, 2013, p. 258), therefore, the complex relationships that exist within a problem must be taken into account in order to foster knowledge and debate within the science. According to Jonassen (2000, p. 84) "the few problems that students encounter are usually well-structured (history) problems that are inconsistent with the nature of the problems they need to learn to solve in their everyday lives". Based on this premise, we arrived at the application of this study, whose emerging problem was: What learning relationships can be built with undergraduate Biology students based on the discussion of complex fluid problems in Halliday? To solve this problem, we used the Grounded Theory (data-based theory) as a methodological strategy, which seeks to idealize theories going inversely to what positivist methodologies bring.

This methodological resource allows the researcher, when going through the three stages of codification (open, axial and selective), build a new theory with the collected data. Based on this relationship, we built a didactic sequence, in order to familiarize students with the complexity and solving of complex problems. Discussions and analyzes of all stages of classes revealed that students did not have complex thinking and did not know this approach, but when instigated they changed their worldview, making it possible to open and establish a dialogue between scientific knowledge, situations daily life and the interrelationships within science and within distinct areas. On a new approach to solving complex problems, we found that three codes were essential for their visualization to be modified during the stages, namely "research, historical valuation and teacher training" (CORREA, 2020, p. 2-65) . Through these data, teachers from the most diverse areas, based on the theory of complex problems, can use the three indicators for a new conceptualization of the problems to be applied.

2 Conclusion

The research shows that as new indicators, teachers and students can overcome the fragmentation of knowledge, expanding their vision of the world, and offering future generations, a more human and scientific training.

References

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