Decoding of the Disciplines in Human ecology lectures

Asta Danilevičiūtė
asta.danileviciute@vdu.lt
Vytautas Magnus University, Lithuania

Teaching/Learning is a complex and challenging process where the ability of teachers to transfer their knowledge to learners and at the same time create new knowledge with learners is of particular importance. During lectures, teachers demonstrate their expertise and knowledge of the subject taught, but despite their efforts to present everything clearly and consistently, most teachers may notice that students find it difficult to assimilate, understand or learn certain things presented during lectures. It has been confirmed that an active involvement of students in the learning process helps them assimilate the learning material more easily. Recently, more different methods that are used to involve students or pupils in the learning process have emerged. One of such methods is the Decoding the Disciplines (DD) model. This model is innovative in that it increases student learning and specialist teaching by narrowing the gap between expert thinking and that of a complete novice. The DD method is based on 7 steps and they serve as a series of questions which help teachers reflect upon their experience and reveal how their expertise knowledge has been formed. The aim of this article is to reveal how the DD method helps to overcome bottlenecks in Human Ecology lectures.

Keywords: **Decoding the Disciplines, ecology problem, risk calculation, ecosystem**

Introduction

Decoding the Disciplines breaks down the basic operations required in a particular class and presents them systematically to students. This methodology can help teachers recognise their mental action; at the same time, teachers, by showing their knowledge how their expert knowing has been formed, can help students recognise their own (students') mental actions, which can help students use the latter in similar or other disciplines. This method is interdisciplinary and, thus, can be applied in a variety of disciplines, for example, in history (Middendorf et al. 2014; Pace, 2004,), biology (Zolan, 2004), astronomy (Durisen, 2004), mathematics (Schultz et all., 2012) and others. Teachers have observed that this method provides new ways to enhance learning in their classes and also brings new excitement to their teaching (Middendorf & Pace, 2004, p. 10).

Theoretical background

In general, human ecology is an interdisciplinary field of research in which investigations aim to reveal how humans function in different periods and operate in different ecosystems and cultures in order to understand factors and processes that have influence on the interaction between humans and the surrounding environment. Due to its interdisciplinary character, human ecology requires a very broad thinking and understanding, since, in order to understand systems and processes, the knowledge of sociology, anthropology, economy, biology or even archaeology is necessary. Ecological problems caused by anthropogenic activities are complex, they are related to technology, economy, sociology and ethics. A successful resolution of ecological problems is possible only by combining efforts

of specialists of different fields of science and studying reasons that cause environmental degradation and damage to ecosystems. It is in this interdisciplinary context due to teachers' broad and multi-layered approach to the existing problems that students may not understand certain things presented during the lecture. The Decoding the Disciplines methodology in this case is appropriate as it encourages to show *how to* instead of transferring the actual knowledge of *what*. The ability of teachers to present teaching/learning material to students at the same time revealing how teachers themselves have learnt it, can help students understand how different aspects of human ecology manifest themselves and are visible in interdisciplinary context.

This article introduces the application of the Decoding the Disciplines methodology in the course "Human Ecology" of the bachelor's study program "Environmental Sciences," which is compulsory for the third course students. The course is designed to gain the knowledge and practical skills related to the human population and environmental interaction, environmental hazards, health effects of environmental and occupational factors and the basic requirements for a healthy environment and to develop students' skills to recognize ecological problems. The course focuses on practical assessment of biological, chemical and physical hazard risks and their effects on health.

Practical application of the DD method

After getting acquainted with the DD methodology, the aim was, first of all, to identify places where students' learning is hindered during lectures. When reflecting on the many years of experience in teaching this subject, a number of bottlenecks were formulated which are more difficult for students to understand or most of them get stuck in certain places. These bottlenecks were a signal to the teacher to change the teaching methodology and disclose to the students how the teacher forms his/her expert knowledge. To overcome these bottlenecks, the Decoding the Disciplines method was chosen to decode bottlenecks encountered in teaching/learning activities (Pace & Middendorf, 2004; Middendorf & Shopkow, 2017). The aim was to help students decode such bottlenecks as an ecological problem solving, risk calculation, the interaction between the social system and the ecosystem and to notice essential differences between a natural ecosystem and a human created system. Although these bottlenecks seem not to be complicated, they are not easily understood by students.

Thanks to this method, students do not stay with bottlenecks, but, by using critical thinking, they can easily cope with a problem or issue arisen in one course or another, since "the Decoding the Disciplines process helps set the stage for a series of small but cumulative successes" (Middendorf & Pace, 2004, p. 8), "because large, complex tasks are divided into their constituent parts and each part is modelled and practiced" (Middendorf & Pace, 2004, p. 8).

Solving an ecological problem

The Decoding the Disciplines method was applied to help students overcome the bottleneck when solving an ecological problem. It is not clear to students what concrete steps they have to take in order to solve an ecological problem. This bottleneck is important to students since after graduation they could independently solve/reduce an ecological problem they face or notice signs of an emerging ecological problem and take appropriate actions as specialists. It is important for students to understand that an ecological problem or an environmental problem includes different environmental factors: climate change, deforestation and all sorts of pollution (chemical, physical, biological, etc.), which can cause harmful effects not only for nature but also for human health. In the process of solving an ecological problem, students miss some important steps or they do it in an incorrect way. Ecological problems caused by an anthropogenic activity are complex and are related not only to tech-

nologies and environmental pollution but also to economics, sociology and ethics. A successful resolution of ecological problems is possible only by combining efforts of specialists of various science fields and having properly analysed reasons that have caused environmental degradation and damage to ecosystems, which can endanger human health. Thus, by applying the DD methodology and appropriate steps or/and questions, working in a group or cooperating with other students in the group, the students could independently identify/notice the problem in the given examples and find ways to eliminate or reduce the problem. In addition, the students were able to realize that the ecological problem was not only related to environmental damage (damage to nature) and predict future consequences for human health.

The calculation of ecological risk

Another bottleneck is that students do not know how exactly to calculate risk. This risk is associated with human health because Human Ecology is a discipline that describes relationships between humans and environment, i.e. how humans can impact environment and how environment can impact human health. Risk calculation is essential for students because it can help them take certain measures to avoid or reduce environmental impact on human health. Students get wrong that risk calculation is one of several statistics that have become increasingly important in research (ecological study) and decision-making. In human ecology, risk is the probability that an event will occur, e.g., that an individual will become ill, injure or die within a stated period or by a certain age. In this bottleneck, the teacher used to explain how the risk should be calculated; however, the application of the DD methodology revealed to the students a broader approach to risk calculation, i.e. the students were able to analyse the given examples themselves, to describe and determine environmental factors that could affect risk calculation, to provide conclusions and recommendations for risk reduction.

Defining the relationship between the social system and the ecosystem

The third bottleneck is the relationship between the social system and the ecosystem. This bottleneck is essential for students because the social system is the central concept in human ecology and human activities that have impact on ecosystems are strongly influenced by the society in which people live (Marten, 2001). When analysing the relationship between the social system and the ecosystem, this method helped the students understand that the social system and the ecosystem are not separate systems but they interact with each other and consist not only of individual elements and that elements, although in different systems, are bound by different links. In addition, the students could realise that, when affecting one part of the ecosystem, the social system can irreversibly damage other parts of the ecosystem. Therefore, when understanding the relationship between the social system and the ecosystem, the students can take preventive measures in order to avoid irreversible processes in the ecosystem and a negative response to the social system. The research field of the ecosystem services takes the other side of the equation, i.e. how changes in natural systems feed through to changes in human well-being (MEA, 2005; Milner-Gulland, 2012).

Conclusions and researcher's reflection

Several difficulties were encountered when starting to apply the DD methodology. First of all, a lot of time was spent reviewing the content, methodology and tools of teaching. Secondly, one of the greater challenges was to uncover expert knowledge and mental actions and find a way to deliver that knowledge to the students. The application of the DD method required the teacher to leave the comfort zone and rethink his/her activities as well as to discover ways to accurately present the learning material to the students in a different way and in such a way to update the curriculum and teaching methodology. The revealed bottlenecks encouraged to

include more active methods and use visualisation that helps students assimilate the learning material and at the same time promote their critical thinking. It was difficult to describe to the students how the teacher has created his/her expert knowledge. It is not easy to reflect on personal practice and uncover processes of transformation from being a novice teacher to becoming an expert in the field of human ecology. As mentioned above, this method forces teachers to leave their comfort zone, critically evaluate and reflect on their experience and how expert knowledge has been formed as well as be more creative. Despite all these challenges, the application of the DD method in the subject Human Ecology revealed that students willingly participate in the lecture, it is easier for them to assimilate the material of the subject and their active involvement increases their interest in the subject.

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