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# Decoding the Disciplines

in European Institutions of Higher Education:  
Intercultural and Interdisciplinary Approach to  
Teaching and Learning

edited by Sandra Chistolini



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Intercultural and Interdisciplinary Approach to  
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# Editorial introduction

In a time when higher education is going through massification processes and learners come with diverse social and cultural backgrounds, different learning experiences, or cognitive skills, teachers are challenged to rethink their roles and learning methods in response to learners' expectations of their development. Therefore, the need for new and innovative methods which help teachers to re-evaluate their teaching practices emerge. The Decoding the Disciplines methodology was created by academics at Indiana University (IU), Bloomington USA, aiming to implement teachers' metacognitive processes and encourage them to reflect on their practices, uncover their personal knowledge construction and promote learners' understanding of the disciplines. Initially developed in the United States, Decoding the Disciplines methodology was introduced to universities across Europe within the framework of Erasmus+ Project "Decoding the Disciplines in European Institutions of Higher Education: Intercultural and Interdisciplinary Approach to Teaching and Learning", no. 2016-1-BE02-KA201-017337. The Project was implemented in the partner institutions: VIVES University of Applied Sciences, Kortrijk, Belgium; National University of Ireland, Galway, Ireland; Università degli Studi Roma Tre, Roma, Italy; The Ethnic Kitchen (NGO), Vilnius, Lithuania; Vytautas Magnus University, Kaunas, Lithuania, in the period from 2016 to 2019.

This Scholarly E-Journal presents papers, discussing diverse experiences and results of the Decoding the Disciplines application in the Universities of Belgium, Ireland, Italy, Lithuania. We do believe, that the Scholarly E-Journal will serve as a great resource for higher education institutions and individuals, as it provides an opportunity to approach major issues through the lens of diverse academic disciplines, such as communication studies, didactics and

teaching strategies, epistemology issues, natural sciences and humanities. Further information and documents on the application of the methodology are available on the Open Educational Resources (OER) website <http://www.decoding.education/>. The Editorial team invites colleagues to respond to the Call in order to re-engage in discussions on empirical research, praxis and theoretical considerations in a world of what appears to be multiple realities of Intercultural and Interdisciplinary knowledge. In this context challenges and difficult decisions are fundamental to improving our teaching and learning profession in Higher Education.

The contributions reflect on the entire period of the Project, describing the current situation and proposing strategies for the future. One hope is that by doing so we will better understand how to face current and future challenges in higher education in the perspective of Intercultural and Interdisciplinary Approach to Teaching and Learning.

Financial support provided by the Erasmus+ Programme is gratefully acknowledged.

We really appreciate the very distinct contributions of the Authors who developed the Decoding the Disciplines methodology as pioneers in Europe.

Editors-in-Chief:

**Sandra Chistolini**

*Università degli Studi Roma Tre, Roma, Italy*

**Giedre Tamoliune**

*Vytautas Magnus University, Kaunas, Lithuania*

**Ineke De Coninck and Hugo Verkest**

*VIVES University of Applied Sciences, Kortrijk, Belgium*

**Jolanta Mickute**

*The Ethnic Kitchen (NGO), Vilnius, Lithuania*

# Teaching and learning the language of Visual Media

Kristina Juraitė

kristina.juraite@vdu.lt

Vytautas Magnus University, Lithuania

*Proliferation of new technologies are changing the nature of the media and are creating a new cultural and educational environment, a lot more dependent on the media than ever before. Surrounded by all kinds of information, verbal, oral, visual, multimedia and mobile, we are more and more confronted with visuals of different types, including pictures, photography, films, TV, video games, podcasts, advertising, and social media. Visually saturated media demand for specific competences and social practices aimed at better understanding, critical thinking and practicing visual logic of meaning production. While conceptualizing the need for visual literacy in contemporary media environment, the paper reviews different approaches in visual media education and reflects on the use of Decoding method in learning to communicate through images.*

**Keywords:** visual media, visual education, visual literacy, Decoding method

## Introduction

Converging communication technologies, diversified media channels, segmented media markets and fragmented audiences are creating a new media environment worldwide. At some point, quite homogeneous communication practices, dominated by national and local media outlets, are transforming into a diversified media system with numerous media channels, modes, platforms and publics. In this very noisy world, the way media is used transforms into permanent multitasking, selective and interactive engagement across various media modes and channels.

Saturated by all kinds of information, verbal, oral, visual, multimedia and mobile, people are more and more confronted with visuals, including pictures, photography, films, TV, video games, podcasts, advertising, etc. The images, we are surrounded by, construct our attitudes, experience, social stratification – class, racial differences, gender and sexuality. Indeed, we live in a visual mediapolis, where mediated

public space is dominated by various kinds of images, which are supporting and transforming our everyday life, work, education, entertainment and communication (Silverstone, 2007).

Addressing communication transformations in today's societies, Manuel Castells argues that “the major convergence in communication is not technological or organizational, but cultural, to put it simply, those changes that are taking place in the minds of communicative subjects, who integrate various modes and channels of media in their everyday life and interaction with each other” (Castells, 2009). Hence, in order to be able to navigate through the multimedia culture, new generation needs to learn reading and writing the language of image and screen. On the other hand, research shows that integrating visual in teaching also results in a more successful learning and performance (Aisami, 2015). Apparently, there is a growing need for visually oriented curriculum, focused more on visual literacy and competences in production and consumption of visual messages (Messaris, 2003).

The paper conceptualizes the need for visual literacy by placing image-based competencies in the center of media educational discourse and curriculum. Also, it presents the case of visual education at the university level by decoding the obstacles in learning to communicate through images.

## Framing visual literacy

Considering the pervasiveness of media in contemporary society, critical-thinking and media literacy have become an important subject of educational discourse and curriculum across the world (Gaines, 2010). European Commission, UNESCO and other international organizations emphasize that citizenry needs to have proper communications skills and technological competences to fulfil societal functions in the digital era. This requires a major shift in skills from traditional literacy towards the inclusive and interactive use and the critical understanding of different media around us. With an emphasis on critical thinking and creative problem-solving skills, media literacy is mainly framed as capacity of individuals to interpret, analyse, contextualise and produce information in a variety of forms and contexts (Celot, 2009). This is a fundamental competence not only for youngsters but also for adults and senior people, parents, educators and media professionals. Proponent of critical pedagogy, Paulo Freire (1972) also refers to media literacy as a premise for individual empowerment against manipulations and oppressions. For literacy trainings, he was using film-slides to promote collective learning and critical thinking among peasants. In late 1980s, Freire established the Central laboratory for Educational Informatics, while also investing in new media technologies and their use for critical pedagogy purposes (Goldfarb, 2002).

Media literacy or education consolidates multiple communication literacies and may be used in different ways and for different purposes, depending on the interpretation of the concept such as *digital literacy*, *computer literacy*, *crit-*

*ical literacy*, *film literacy*, *information literacy*, *audiovisual literacy*. This results in policies that focus on different aspects of education, technology and communication (Serafini, 2014). Contemporary media, social networks, gaming is overloaded with visuals as a form of non-verbal communication, including pictures, symbols, signs, maps, charts, graphs, diagrams, photographs, models, etc. (Aisami, 2015). Visually saturated media demand for specific competences and social practices aimed at better understanding, critical thinking and practicing visual logic of meaning production.

As a multidisciplinary concept developed in 1960s by John L. Debes, an executive of the Kodak Corporation, visual literacy refers to “a group of vision-competencies a human being can develop by seeing and at the same time having and integrating other sensory experiences... When developed, they enable visually literate persons to discriminate and interpret the visual actions, objects, symbols, natural and man-made” (Debes, 1969, 27). To put it shorter, visual literacy refers to a set of vision-based competences and skills to think, learn and express oneself visually. These cognitive abilities should be learned and developed rather than gained intuitively.

## Towards actively oriented visual curriculum

Taking students inside visual production process is one of the best ways to develop students' cognitive abilities and understanding of visual media and communication. Trainers and researchers agree that visual education should focus on creating visual images and meanings rather than consuming them only (Messaris, 2003). Abilities to communicate through images in a meaningful way are not self-evident and require intellectual efforts, as well as practical skills. In other words, this kind of knowledge must be gained through hands-on visual education aimed at enhancing students' cognitive abilities by putting images together and applying visual conventions in a meaningful way. Hence, po-

tential of visual education interventions is based on theoretical and practical visual learning, as well as transferable skills gained, such as creativity, problem solving and critical thinking.

Students in Popular and Visual Culture class at Vytautas Magnus University, Lithuania have to produce a creative project and had to critically reflect on the production process demonstrating their creativity and critical thinking. The main aim of the course is to integrate hands on learning in a meaningful way, i.e. linking theory and practice of visual and popular culture. In the beginning of the class students are provided with an overview of classical and modern approaches to visual and popular culture. In the second part of semester, they are invited to apply the knowledge in planning, managing and producing a visual project on a selected topic. However, switching from abstract conceptual thinking into very concrete visual thinking and meaning production is a challenge for many students.

The assignment requires students to independently choose the project idea, topic, objectives, audiences, relevant media and relevant examples to follow. However, often students are finding it difficult to identify a topic and develop an action plan, when ideas are generated and an overall vision of the project is planned in detail (writing a script for video or developing an idea/topic, deciding on location, subjects, media). Therefore, it was decided to monitor and help students to engage with hands on learning approach and facilitate pre-production phase. Monitoring of visual production includes discussing project development phases in class and providing students with a feedback. Explaining the importance of pre-production phase and project planning. Also, the role of the project brief explained, which is about describing project idea in detail, including objectives, target audience, content, aesthetic and technological means, research done, constraints, and personal motivation in the project.

Decoding method was applied to encourage students to switch from abstract conceptual thinking to concrete practical engagement

and planning of creative projects. To address the bottleneck identified together with the students, an expert of film making Laisvis Karvelis was invited to meet with the students and share his professional experience and knowledge about the creative process of visual production. When meeting the students Laisvis was first of all emphasizing creativity and self-confidence as very important conditions of visual production. Also, he gave a couple of examples of his recent projects, including practical challenges which are indispensable in the working process. The main recommendations provided included creativity and problem-solving approach in visual production. Students were appreciative for the opportunity to learn from well experienced professional and felt more self-confident with the first stage of visual production.

## Final reflections

In the media saturated-world, images and visual representations are critical for understanding and communicating in the social world. As an important symbolic and cultural capital, education should respond to dynamic technological environment and sociocultural changes via new pedagogies and multiple literacies that could empower people to survive and thrive in a complicated and permanently changing world. Teaching and learning these literacies should be considered as the core objective for the democratic, sustainable and egalitarian society:

“This is a time of challenge and a time for experiment. It is time to put existing pedagogies, practices, and educational philosophies in question and to construct more democratic and progressive ones. It is a time for pedagogical experiments to see what works and what does not work. It is a time to reflect on our goals and to discern what we want to achieve with education and how we can achieve it.” (Kelner, 2006).

Gaining the multiple literacies which are critical to use a range of technologies in a knowledgeable and meaningful way becomes crucial for all. Indeed, citizens need specific skills in

reading information from all media types, understanding and critically assessing the content and context in which information is presented, and producing and sharing communication content in a variety of forms and contexts. Much more experience and knowledge which is required today cannot be gained intuitively while using images as means of expression, communication, and exploration. Hence, media and visual literacy should be recognized as indispensable competence that enables us to live, work, educate and communicate in ever changing world.

While learning visual thinking as the „language of their generation“, students are encouraged to shift their focus from consuming of media to creating and producing (Hofer & Owings, 2006). Hands-on learning approach should be considered as the core objective of an actively oriented visual curriculum. By developing students' cognitive abilities of visual thinking and communication, education interventions usually integrate theoretical and practical learning, and promote transferable skills, including creativity, problem solving and critical thinking.

To support and motivate students in Popular and Visual Culture, Decoding method was purposefully applied for the international group of students. As a result of monitoring and identifying certain difficulties encountered in the visual learning process, Decoding method was effective and appreciated by students. They felt more relaxed, confident and motivated to engage into the hands-on visual learning process. Decoding method was also useful for building dialogue, self-confidence and cooperation among the students of the class.

To conclude, the role of educators is to engage students into hands-on learning and to become producers, as well as critical users of visual media. To facilitate the process of learning, it is crucial to provide necessary resources and tools for students to develop this knowledge. Last but not least, visual teaching and learning also requires special knowledge, resources and tools for teachers to make progressive use of communication and information technologies in their classes (Kahn & Kellner, 2007).

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# Reflection for helping students learn disciplinary paths of analytical thinking

Vaida Jurgilė

vaida.jurgile@vdu.lt

Vytautas Magnus University, Lithuania

*The Decoding the Disciplines methodology aims to teach students to think like experts in specific tasks. The aim of the methodology is to identify a bottleneck in the course content. In various study programs, students mainly lack analytical thinking or independent study of the material. Due to this, students do not understand the material and are not able to recognize necessary aspects. Results of the Decoding the Disciplines methodology suggest that the application of this methodology may facilitate student learning.*

**Keywords:** Decoding the Disciplines, bottlenecks, analytical thinking, students, risks

## Introduction

Decoding the Disciplines begins with a simple task, i.e. the identification of the bottlenecks to learning, namely, points in a course where the learning of many students is interrupted (Anderson, 1996). Students in higher education come from very different social groups, cultures, disciplines and age groups. Despite the fact that the same material is discussed again and again during different semesters, some students still do not understand how to assimilate this material. The aim to narrow the gap between teacher and student thinking or, in other words, teaching analytical thinking is one of the main goals of this methodology. The method helps to reveal how the content of the particular discipline is created. However, the aim is not to transfer as much content as possible, because, in the age of information technologies, information is easily accessible to everyone. This has created the need to teach students to select useful, reliable and diverse information. Often students mainly lack analytical thinking or independent study of the material. Students are not able to discuss the material they read and identify essential differences between several things in the materi-

al under discussion. This requires a lot of reading and analytical thinking. Learners are more willing to start the interpretation of the text without first getting acquainted with the content of the text and they are not able to identify essential differences. However, it is an essential aspect of the course to develop students' ability to recognize the main criteria and analytical thinking. Students need to get acquainted with the content of the text before they start interpreting it. Nonetheless, they are constantly skipping a thoughtful observation stage. Students struggle to generate new knowledge or opinion while reading material and they are not able to find essential differences. Students face a great challenge whenever they are asked to discuss the material they have just read and find essential differences between particular aspects in the text.

## Theoretical background

The Decoding process in brief (see Figure 1).

The first two steps in the decoding methodology involve the identification of bottlenecks and explication of tacit thinking of experts. By using



Fig. 1. Decoding the Disciplines Wheel (by Middendorf J. and Shopkow L., 2018)

student works, it is possible to identify a place or places where students most often get stuck in the process of learning. The mental action is defined as the action taken by the specialist in order to avoid getting stuck in the same way the students get stuck (Middendorf J. and Shopkow L., 2018). The following steps are a part of the methodology of the presentation of bottlenecks in which the teacher teaches students to think analytically and do it effectively. These steps of the methodology partly overlap with each other. Students are given practical tasks which help them demonstrate their abilities to analytically analyse the given task. The feedback provided afterwards shows where greater efforts should be made. The seven steps are extremely useful for teachers as they help to decode bottlenecks to student learning. The interactive nature of the decoding process tends to blur the distinctions between these steps (Middendorf J. and Shopkow L., 2018).

### Description of the classroom

The Decoding the Discipline method was applied for the Bachelor students of Education in the study course “Project Management.” The aim of the course is to create conditions for students to gain and advance skills of managing educational projects by improving activities of educational organizations and educational conditions for the target groups.

### The case study on the Decoding the Disciplines method

First of all, the aim was to identify the bottleneck. As mentioned above, the bottleneck to analytical thinking is that the learning material provided to students often leads to a feeling of uncertainty and students are not able to differentiate between several aspects when

they are asked to identify certain methods or instruments. Students lack basic skills of analytical thinking. It is often difficult for students to discuss the material that has been read or to find essential differences between the material read or, sometimes, even to state the main idea of the text. This bottleneck was chosen because students were found to lack analytical thinking skills when analysing scientific material. In addition, poor exam results implied such a presumption. The aim to narrow the gap between teacher and student thinking or, in other words, teaching analytical thinking is one of the main goals of this methodology. As mentioned above, there was a need to teach students to select useful, reliable and diverse information.

The second step focused on the identification of discipline specific ways of thinking about the bottleneck. Multiple aspects of analytical thinking prevail, i.e. the ability to transform abstract questions or scientific material into specific questions or to define specifically by pointing out essential differences. This bottleneck usually arises from the lack of analytical thinking. Students read the material, they try to identify certain essential differences, but it

becomes difficult for them to discuss what they have read and they cannot find essential differences. These concepts are important for students' ability to scientifically discuss the material they have read or simply select the essential information. The discussion on how to decode students' thinking is offered by Middendorf and Pace (2004).

After having disclosed this bottleneck, the aim was to model certain tasks to help students understand the concept of analytical thinking. The work in the lecture started with an introduction of the concept of 'risk' in project management. Since the aim of the course was to create conditions for the students to get acquainted with concepts and principles of the management of educational projects, the students were encouraged to discuss the role of educational projects and management functions. The task formulated by the teacher was related to the identification of the concept of 'risk.' By presenting real-life examples, the students were asked to reflect on situations when certain risk may occur. The teacher then was able to identify the bottleneck or the place where the students got stuck. All this led to a more in-depth discussion with the students.

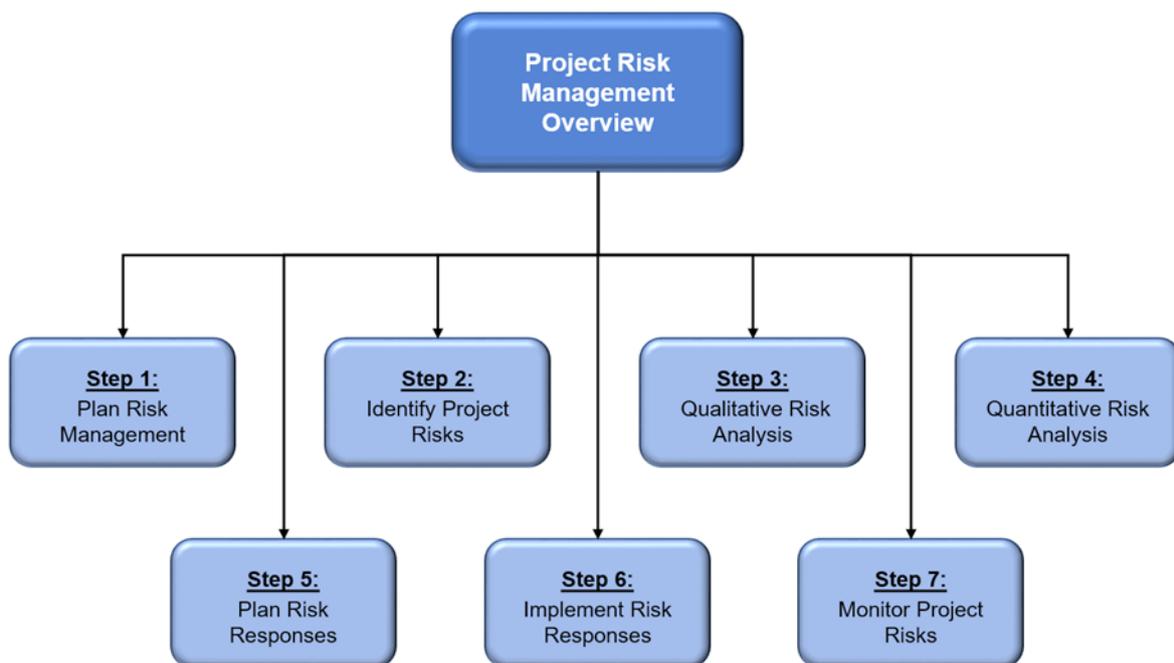


Fig. 2. An Overview of Project Risk Management (by Jurie Steyn, 2018)

During the discussion, the teacher asked the following questions:

- What is 'risk'?
- What do you usually do when you face a problem? Describe certain steps in your problem-solving process.

Afterwards, the discussion between the teacher and the students took place. By focusing on the answers received, the teacher modelled the next steps. After the discussion, the students prepared the final answers and definitions. At this stage, the revision was made on the basis of the same questions, by adding a practical task, analysing real-life project applications, encouraging the students' analytical thinking and asking them to give examples.

The next step involved feedback. In order to consolidate and demonstrate analytical thinking skills, the students had to work in groups to provide a definition of the concept and notice possible differences. The teacher reacted to considerations of each group. Then the students discussed the common mistakes they had made as well as ways how to avoid such mistakes and identify differences. By collecting information about what happened in the classroom and by analysing and evaluating this information, the teacher identified and explored practices and underlying beliefs, which may lead to changes and improvements in the teaching process. The teacher discussed the importance of all this with the students. During the class, the students wanted to know and understand the concept of the risk of a project and the main similarities and differences between models and other instruments. They wanted to learn more and find out the main characteristics which could help them recognize the mentioned similarities and differences. During the class, the students participated in discussions and shared their opinions. It should be noted that classes where students have opportunities to communicate with each other help them effectively construct their knowledge. By emphasizing the collaborative and cooperative nature of scientific work, students share responsibility for learning with

each other, discuss divergent approaches and shape the direction of the class.

### **Researcher's reflection on the Decoding the Disciplines method**

When discussing project risks during the first meeting, the teacher presented to the students all related features and aspects and showed all successful and unsuccessful examples. The students had to demonstrate their analytical thinking and share their opinions. However, since students want to go directly to interpreting the text without first getting acquainted with its context, the teacher's tasks are to encourage them to reason and argue both sides of the issue. The reflection was focused on the questions related to the concept of the risk of a project as well as similarities and differences. The teacher encouraged the students to make connections to a real-life situation and identify certain patterns. This proved to be a great way to practice students' skills of analytical thinking. Analytical skills refer to the ability to collect and analyse information, problem-solve, and make decisions. These strengths can help solve problems and improve upon its overall productivity and success in the learning process.

Decoding the Disciplines method helped students understand how to analyse information analytically and how to select necessary information. This method encouraged the teacher to review the course being taught from the perspective of the student and not from the perspective of the expert of the subject. Each part of the method made it possible to understand why this particular bottleneck was encountered by the students. It should be noted that, by breaking down the bottleneck task into small component parts, the expert can easily model scientific thinking for students. Of course, there were some interferences. First of all, the work was done in a small audience and the students' experience was different. Due to a diverging experience of the students, it was quite difficult to manage time, since some of the students responded very quickly to the assignment but others needed more time to think. Despite

these shortcomings, this methodology proved to be very effective for working with students. It is worth mentioning that the Decoding the Disciplines method may also offer potential for other bottlenecks for students within the field of Education.

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# Decoding the Disciplines: supporting the university study experience through a game-based model

Martina Marsano

[martina.marsano@uniroma3.it](mailto:martina.marsano@uniroma3.it)

Università degli Studi Roma Tre, Italy

*Improving education and training systems is one of the main objectives of the strategic framework for European cooperation in education and training (“ET 2020”). In this regard, the methodological approach of Decoding the Disciplines allows teachers to act strategically in order to improve the teaching and learning process, focusing on issues that are often the cause of student failure. The present paper refers to a doctoral research, that is still ongoing, which, by focusing on the construction of a game-based model of didactic support, intends to enhance the students’ university experience and is particularly connected to the Decoding the Disciplines approach.*

**Keywords:** learning, university, gamification, didactic support

## Introduction

The methodological approach of *Decoding the Disciplines* started in the United States in the early 2000s, as the result of the reflection and work of professors Joan Middendorf and David Pace (2004) of the Indiana University of Bloomington. Starting from the theory of *mastery learning*, this methodological approach involves a reversal of the traditional model of teaching and learning, processes of which the teachers are protagonists as much as the students. In the first place, the teachers have to undergo a detailed analysis of their way of teaching, of communicating the contents of their disciplines and of interacting with the students: the teachers must understand that the learning outcomes of the learners depend on the modalities through which they help students in developing their comprehension skills (Chistolini, 2017). It is fundamental to identify the moment in which the so-called *bottleneck* appears, namely the obstacle that does not allow the knowledge to flow and therefore the student to learn. Likewise, the students are encour-

aged to reflect on the elements that contribute to increase their difficulties, and therefore they have to identify them and operate strategies in order to overcome such obstacles.

This approach turns out to be particularly useful and beneficial especially if we refer to the current socio-cultural context, which is characterized by elements of instability and uncertainty that also involve the educational field. For example, the Italian context related to higher education does not appear to be particularly positive: indeed, in Italy, the university dropout rate is among the highest in Europe and, at the same time, the number of people holding a tertiary education degree is among the lowest (Anvur, 2018; Eurostat, 2017).

It is important to remember that one of the main objectives of the strategic framework for European cooperation in education and training (“ET 2020”) is to improve the education and training systems of the countries belonging to the European Union, by promoting smart, sustainable and inclusive growth.

## Theoretical background and methodology

In this sense, the present contribution refers to an ongoing doctoral research that has as its focus the creation of a game-based model of didactic support which aims to provide students with the appropriate tools to succeed along their university experience. The activities of the game-based model are related to didactics but they have a ludic approach, with characteristics derived specifically from games (Huizinga, 1946; Caillois, 1981), video games (Gee, 2003; Salen, 2008), gamification (Kapp, 2012) and Alternate Reality Games (Szulborski, 2005).

If traditional teaching, based on taught classes, does not always allow the students to play a fully active role, games and video games have characteristics that are particularly suitable for the promotion of learning by requiring the direct involvement of the students – elements that are strongly linked to the theory of *learning by doing* (De Castro, 2016). The characteristics that make games and video games so engaging can be transferred into the reality in order to make everyday life activities more engaging and to produce a behavioral change, according to, for example, the gamification approach (McGonigal, 2011; Werbach, & Hunter, 2012).

Specifically, the study involves some students of the Degree Course in Educational Sciences and Primary Teacher Education of the Department of Education Sciences at the University of Roma Tre. Some of the students involved show difficulties in various areas, such as difficulty in managing their emotional states, high levels of disorientation, difficulty concentrating on their studies, lack of perseverance in their commitments, attribution of their failures to external factors, elements that represent the so-called *bottleneck*. These problematic issues emerged from an initial try-out phase. This was carried out within two workshops with the students of the Degree Course in Primary Teacher Education, and through the compilation by the students of three questionnaires, aimed at iden-

tifying the critical elements encountered by them – the *Questionnaire for Learning Strategies* (QSA – Pellerey & Orio, 1996), the *Zimbardo Time Perspective Inventory* (ZTPI – Zimbardo & Boyd, 1999; Tr. it. Riccucci, 2009) and the *Questionnaire on the University Study Experience* (which has been used for the survey in 2018).

Within the game-based model students carry out different kinds of activities: they therefore have the opportunity to get in touch with those who work within the Department's tutoring services, they are guided and supported during the course activities, they have the opportunity to deepen lecture contents, they can work together in order to achieve specific objectives and use the Moodle platform of the university to have discussions with their colleagues – for each activity carried out, students get feedback in terms of points and badges.

It is assumed that, through the adoption of the game-based model it is possible to increase the self-regulation skills of the students both on the qualitative (orientation, motivation to learn, interests, self-efficacy and agency, social relations) and quantitative levels (course attendance, number of exams taken, improvement of exams grades).

## Conclusion

The methodological approach of *Decoding the Disciplines* presents multiple advantages, because, also in line with the objectives of the “Education and Training 2020” strategic framework and the UN “2030 Agenda for Sustainable Development”, it intends to promote the development of learning contexts within which all students have the opportunity to acquire the necessary skills to proceed successfully along their educational and personal path. This approach allows the teachers/researchers to obtain a clear picture of the situation in which they are working and to act in an appropriate and systematic way in order to support students to achieve the educational objectives and therefore to improve their study experience.

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# Uncovering tacit knowledge of writing a thesis statement

Giedrė Tamoliūnė

[giedre.tamoliune@vdu.lt](mailto:giedre.tamoliune@vdu.lt)

Vytautas Magnus University, Lithuania

*The Decoding the Disciplines method serves as a guide for identifying learning and teaching bottlenecks, understanding reasons for the occurrence of these bottlenecks and finding different ways to overcome these bottlenecks. This article describes the process of the application of the Decoding the Disciplines method which was used to uncover the teacher's expert knowledge on how a thesis statement should be written. The teacher's in-depth reflections and metacognition allowed to uncover tacit knowledge and overcome a bottleneck of teaching and learning the writing of a thesis statement.*

**Keywords:** thesis statement, Decoding the Disciplines, academic writing

## Introduction

The writing of a thesis statement requires students to demonstrate their critical and analytical thinking skills. Despite the fact that students have to write scientific or other kind of analytical works from the beginning of their studies, a significant number of methodological principles remain as tacit knowledge for them. It should be noted that not all teachers ask to formulate a working thesis statement when writing papers or research reports, thus, students themselves do not develop the habit of formulating a clear thesis statement in each written work, which reflects the position of the author. In this paper, the focus is on a thesis statement used in the context of academic writing, specifically, in final bachelor thesis. Academic writing skills are equally important to all students regardless of the study cycle they are studying at. The ability to express thoughts clearly, coherently, consistently and reasonably is necessary for both writing scientific papers and presenting ongoing research as well as for making other presentations in larger academic and non-academic communities (Huang, 2010; Pinnow, 2016).

## Theoretical background

Bachelor students are taught to write scientific papers from the very first year of their studies. These works should reveal the position of the author in relation to the topic being analysed. In addition, this position should be based on findings of scientific literature and the previous research. In most of the study programs, there are study subjects that develop students' ability to analyse scientific literature, formulate parameters of their research and write scientific papers based on these parameters and findings of the previous research. However, it has been noticed that these study subjects are not always included in the first year of studies. In such a case, for a year or two, students write scientific papers without having clear knowledge and understanding of how it should be done. The knowledge of the main rules and requirements of scientific language does not always help to describe theoretical sources appropriately, constructively, reasonably and clearly and present ongoing research and its findings. On the other hand, even after the completion of the work, it is not easy for learners to present it in a constructive manner in one or two sentences and reveal the essence of the work. It has

been observed that despite all methodological knowledge, students find it difficult to argue and present the completed research work or research idea in a brief and clear manner. This may be due to the fact that students pay insufficient attention to the development of methodological skills. However, it is the Decoding of the Disciplines method (Pace & Middendorf, 2004; Pace, 2017; Middendorf & Shopkow, 2018) that helped to identify another potential reason for the occurrence of this bottleneck. It is teachers' tacit knowledge of how to formulate work parameters and work thesis statement and, in general, how a research work or a study is born.

When it comes to the formulation of parameters, a thesis statement is not always considered as one of the essential elements, although every teacher probably formulates it if not in the work itself then in the mind. A thesis statement is a logically substantiated main idea, a reasoned statement or a conclusion that reveals a the core idea of a scientific work. Each scientific work, be it an article, a dissertation, an essay, a course paper or a bachelor's thesis must have its main idea, in other words, a message that the author wants to convey. This main idea constitutes the backbone of any work and reflects a clear position of the author of the work regarding the work itself. The leitmotif of a thesis statement should be obvious throughout the whole text, it should help to manage available additional information and maintain a specific idea. In this way, the author's position remains clear from the very beginning of the text, despite the fact that the research problem may be discussed from different perspectives. The writing of a thesis statement is not considered as a teaching/learning bottleneck of one particular subject or scientific field. This bottleneck is interdisciplinary, equally relevant to all fields of research; thus, its formulation principles are the same, irrespective of the field of research, the type of a work that is being written (e.g. a bachelor's thesis, a course paper, an essay, a research report, etc.) or culture in which the teaching/learning takes place.

## Insights into the Decoding the Disciplines method

The Decoding the Disciplines method, by its very nature, is suitable for overcoming various teaching/learning bottlenecks. However, it is important to emphasize that this method and its application require a particularly profound reflection of one's activity and knowledge, because it is "<...> so deeply buried in the unconscious of our disciplines that serious and systematic intellectual labour is needed to make us aware of the steps that we need to teach our students" (Pace, 2017, p. 37). In recent years, the Decoding the Disciplines method has become a well recognizable and applicable method that teachers use in their lectures. This method can help to overcome various bottlenecks to teaching/learning. However, due to its specificity, i.e. since it requires particularly profound reflections of teachers for uncovering mental actions, this method is not suitable for overcoming technical bottlenecks such as the lack of knowledge of a foreign language or inactive involvement in online discussions. Nonetheless, in addition to the decoding of concrete teaching/learning bottlenecks, this method is perfect for overcoming emotional bottlenecks, which, quite often, remain either unnoticed or ignored during lectures (Middendorf et al, 2014).

In the case of the bottleneck presented in this paper, it was noticed that it is not easy for students to formulate a thesis statement of their work and briefly introduce the topic of their work. The Decoding the Disciplines method was chosen to help students master the principles of the formulation of a thesis statement. It should be highlighted that this method is oriented towards the teacher's activity and uncovering of his/her mental actions. The need to develop a new method was based on the fact that material presented during lectures focuses on a particular subject taught and on what students should be able to do or know, and also on the fact that a considerable part of knowledge the teacher wants to transfer to the learner is still seen as tacit or invisible knowledge. Therefore, Pace (2017) claims that it is very important

to uncover this expert knowledge so that the knowledge of *how to* would be transferred to learners instead of *what*.

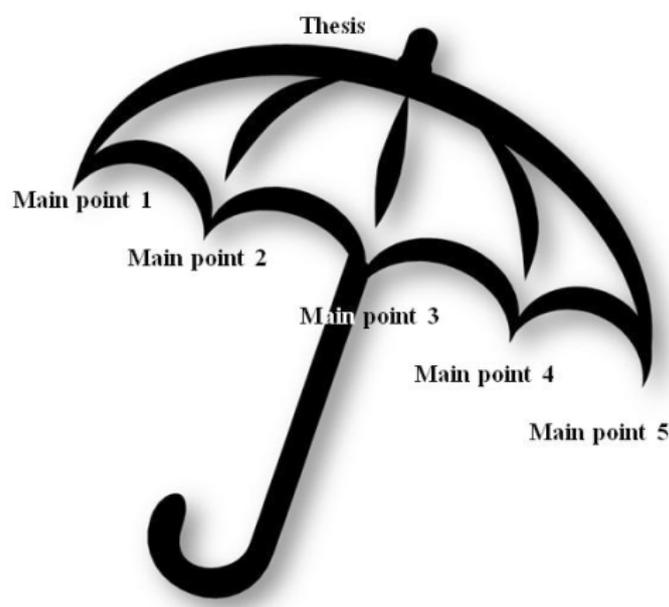
The method is applied following the 7-step structure. These steps are oriented towards the uncovering of the teacher's thinking processes and knowledge. However, it is important to note that an important step that helps to uncover mental actions is the teacher's interview with another expert (Middendorf & Pace, 2004). This expert has to be someone who is either not familiar with the subject or, on the contrary, who is an expert in that subject or the Decoding the Disciplines methodology. It is the way how questions are given to the teacher and the type of these questions that determine whether the teacher uncovers his/her mental actions, or not. In some cases, by applying this methodology, teachers create their own communities (Boman et al., 2017), where they discuss, share their experience, make suggestions and conduct expert interviews with each other. Such consultations and discussions are very useful in understanding what needs to be done at every step in order to help students overcome common bottlenecks.

Overall, this method is seen as a "new framework for thinking about teaching and learning" (Pace, 2017, p. 17) and requires metacognitive skills. Therefore, quite usually this method ap-

pears too complicated for teachers, since, in order to uncover one's mental actions, the teacher needs to change the teaching focus, as the Decoding the Disciplines method emphasizes the importance of what students need to be able to do, instead of what they need to know (ibid.).

### Case presentation

This paper reflects on how the Decoding the Disciplines method was applied to help students overcome the bottleneck of the writing of a thesis statement. This bottleneck was recognised as extremely important in the bachelor study course "Research into Learning Needs," aiming to provide students with the requirements for research planning and implementation, the researcher's role, ethical questions and research methods. In this course, students are encouraged to discuss their own research papers. During these discussions, while students were presenting their final theses, it was noticed that they found it difficult to present their work in one or two sentences. After the bottleneck had been uncovered, the author of this paper was offered to have an interview with two experts of the Decoding the Disciplines methodology, namely, prof. David Pace and assoc. prof. Jolanta Mikute. This interview was intensive and required in-depth thinking, it was also analytical and



conceptual as the aim was to understand how the skill of writing a thesis was mastered by the teacher herself and how students themselves could learn this disciplinary way of thinking.

Following Pace's (2017) suggestion that "our goal should be uncovering the core ways of thinking in our disciplines, not covering them up with masses of facts" (p. 60), the choice was made to present uncovered mental actions through visualisation instead of more theoretical information. Visualised structure of the writing of a thesis statement was presented to the students (see Fig. 1). The applied active assessment method (Angelo & Cross, 1993) revealed that the *umbrella* method helped students master and understand the structure of a thesis statement as well as steps that should be taken in order to write a thesis statement.

This method helped to visualize mental actions that were taken by the teacher when learning to write a thesis statement. Moreover, it helped to overcome some preconceptions (Middendorf, 2014) that the students had related to research process. At the end of the course, the students felt more confident when presenting their research papers and they learned how to present their works in a concise, constructive and argumentative way.

## Conclusions and researcher's reflection

The 7-step framework for the Decoding the Disciplines application appeared to be chal-

lenging as well as engaging. The uncovering of your own knowledge, which is not only in the mind but should be described, was found to be the most difficult and challenging task. The more detailed the description, the easier it is to identify how you have formulated your expert knowledge. The opportunity to discuss the relevant issues with experts of the methodology certainly helped the author of the paper uncover tacit knowledge which was needed in order to help students overcome the particular bottleneck. If mental actions are uncovered in detail and openly, it becomes much easier for the teacher to plan further steps of the application of this process and the process of students' learning.

Another challenge that the teacher, who has decided to apply this method, has to overcome is a linguistic barrier. The method under discussion is based on a number of concepts which are less common in scientific and methodological literature. Therefore, the teacher has to devote additional time for the recognition of these concepts, so that they would be equally understandable and clear to all participants involved in the process, especially to researchers.

To conclude, results of this case confirm that despite the fact that this method requires intensive and in-depth metacognitive activities, "once mastered, however, decoding can allow teachers to present discipline-specific thinking in a clear and effective way" (Pace, 2017, p. 53) and, in this case, to decode to students one of the ways how they can learn to formulate an argumentative and constructive thesis statement.

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# Decoding the Discipline. Also for children?

Hugo Verkest

[hugo.verkest@vives.be](mailto:hugo.verkest@vives.be)

VIVES University of Applied Sciences, Belgium

*Most research and writing about DD training has been done for Higher Education. Like philosophy went out from the universities and made its entrance in primary school as philosophy for children, we worked out a session for kids too. In this paper, the authors argue to adapt DD techniques to work with children. They propose that training in DD has the potential to enhance children's attention and focus, and improve memory, self-acceptance, self-management skills, and self-understanding. Specific exercises to teach children 'decoding' are presented in progression, beginning with the awareness of the external environment, then awareness of the self in the environment, awareness of the body, and finally, DD exercises that feature attending to cognitive processes. Suggestions are made for incorporating decoding into the classroom practice.*

**Keywords:** historical awareness, visual literacy, art of questioning, instructor, museum visit

## Introduction

Method schools as Freinet have a long tradition to give the floor to external partners to present a specific topic in which the pupils are deeply involved. It could be in the light of a visit to the memorial and museum 1815 Waterloo. In the case of the Freinet school 'The House of the Giants' staff members from the Teacher Training College were invited to bring in their expertise on the level of content and methodology. Their concern was how to guide pupils through a museum and stimulate remembering and understanding by training them in 'image analysis' (Verkest, 2004)

## More than facts and figures

The teacher of class 5 (22 pupils) wanted his pupils to discover the relationships between facts. Filling in a worksheet based on a text book only has a very limited impact on the historical awareness of the children. Therefore, he wanted his pupils to be deeply involved in the stories re-

lated with the issues and understand some concepts too. Another aim was that drama, art and critical thinking had to be part of the visit too.

## The bottleneck

Visiting a museum generally asks a certain level of either historical or contemporary 'visual literacy' from its visitors. During supervisions in schools we could notice a lack of time to analyse the images. As teacher trainers, we need to help trainees, teachers and pupils to become familiar with and understand a wide range of cultural practices concerning visual literacy. At the same time, we recognize that visual literacy can be infected by a hidden agenda seeing children as consumers and not as critical citizens (Verkest 2004). Our children are no longer teenagers but screenagers and indicate with 'likes' their priorities and preferences (Verkest 2010). We see that there is no time enough to analyse in depth paintings related to the status of Napoleon as general or emperor. Teachers and trainees tend to ask questions immediately

to get an interpretation that fits the guidelines. No time to develop different interpretations. Answers in textbooks are often spoon-fed. No time for working out the analysis of the images concerning Napoleon and his context. Primary school teachers recognized this fundamental obstacle or bottleneck. Of course, analysing the content of a specific image may be time consuming and asks for modelling (using a particular observation/interpretation scheme).

As a teacher it is not easy to accept that -in this methodology- you are no longer the sage on the stage, but the guide on the side and that your role is merely reduced to launch mental processes. The profiles of an expert and an instructor were used to introduce the DD methodology to the teachers and trainees. On the one hand, the expert has to deliver narratives with relevant content and showing reasonable relationships between facts and concepts. On the other hand, the instructor has to lead the pupils to higher processes of thinking. With our students, we explored the meaning of instructor. Some had a driving or a ski instructor in mind. We explored the features of a driving instructor by collecting the students' own experiences. One said that the instructor shows the candidate driver the possibilities of the own motor vehicle,

but also all kinds of important details regarding traffic manoeuvres and regulations. Another student mentioned that the instructor observes the attitude of the driver and gives short comments after the trip on the road. During the exam, the instructor sits in the back in silence and observes how the candidate follows the instructions of the inspector, a third one replied. Before the start of the project the teacher of class 5 formulated a key question: what do you want to know about Napoleon? Post-it (fig.1) notes with the pupils' names were collected and delivered to one of the experts and instructors. Finding some activities to enhance these mental processes was a real challenge.

### The process

It was a trial and error process that started in March 2017 with a preparatory visit to Waterloo. Before the visit we had a talk with an expert about the museum concept, the combined visit of the memorial and the panorama room. Photos were made of several objects and stops for further comments were selected.

The first activity was based on the first level of Bloom's taxonomy: to remember some key

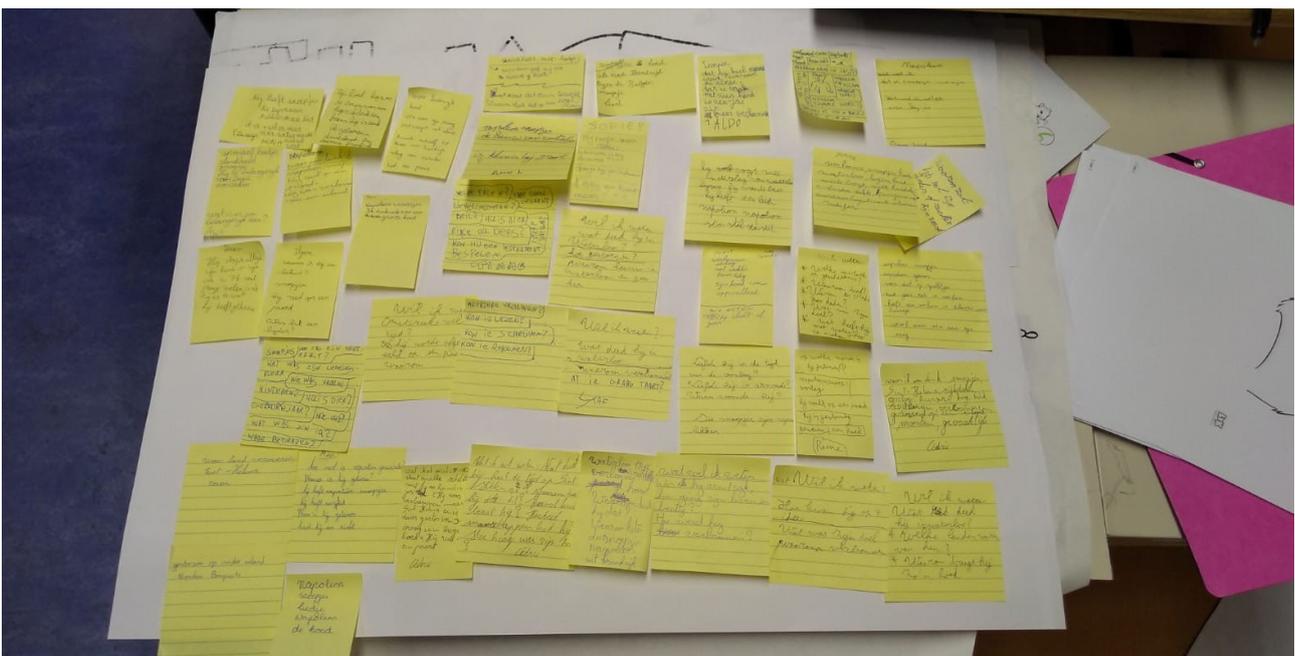


Fig. 1

dates and facts announced in different rooms of the museum. The teacher discovered that a lot of dates were written in Roman numbers. An introduction to this numeric system was necessary before the excursion. The mental process was 'remembering' the 7 symbols of the system and how to understand their meaning. We wanted to apply this numeric knowledge during several moments in our excursion. At least at 5 stops we could train the numeric system and show in which situations and for what purposes people use(d) these numbers.

## The selection

We selected words (concepts) in combination with images based on the museum visit. Two Flemish authors and research journalists inspired us: Bart Van Loo and Johan Opdebeek.



Fig. 2

In a book presentation and TV performance of Bart Van Loo we learned how we have to contextualise the concepts linked with 'Our Napoleon'.

We looked for several strategies to apply his contextualisation during the whole project. The project contained one full preparation day, one day visit and two weeks of processing and modelling. In the close dialogue with the teacher we selected three in-swingers based on the personal experiences of the kids. The first object was a sweet called 'Napoleon' or "bonbon", the second one Napoleon games (once a name of a cyclist team and now linked with casinos) and last but not least a Flemish comic book of the series of Jommeke (fig.1) about the theft of Napoleon's hat. These three elements were provided in a visual format. Our mental operation was understanding the visual material by questioning thoroughly in order to avoid the bottleneck of 'seeing without watching'.

## The art of questioning

Before the session started the pupils received a log book, a diary in which they could write all the information as well as their own thoughts. It was a slow-motion moment (Prior 2012). We took the time to discover the words with them using a very inductive approach.

The selection of the visual data aimed at stimulating the visual literacy of the pupils. At least 3 questions for each visual element were prepared and written down on a Post-it. The teachers walked around in the class to check the questions and to select the most innovated ones in advance.

*Is "bonbon" linked to the French word 'bon', translated as 'good'? Does 'bon' refer to the name of Napoleon Bon-aparte? Is there a link between the shape of the bonbon and a cannon ball? Does the yellow colour refer to Napoleon's favourite colour or the kind of fruit that he liked? Does this sweet have anything to do with his childhood?*

About the games. *Did he like games as a child? Was making war a game for him? Was gambling something that he liked? Or did he like playing cards? Did he promote 'games'?*

About the hat. *Why did he wear his hat in a particular way? How was such a hat manufactured? Did Napoleon only have one hat like this? Was he the only one to possess such a hat? Why is there a sign on his hat? Was the sign linked with the French flag? Or with the French revolution? Where is his hat now?*

All these questions were recorded and gave the teachers and the expert the possibility to work out stories. Both added some extra stories about important political, social and economic outcomes of Napoleon's policy (e.g. the Docks in Antwerp, the Napoleon Civic Code and the standard size of meter and kilogram) based on a chain of keywords.

### The practice

A cloud of words was presented on the screen and the instructors taught the pupils how to make a chain of connections and questions. No questions such as 'what is...?' or what does it mean?' Instead the questions focused on all kinds of relationships.

*Why did Napoleon start with the registration of names and birthdays? How did he recruit his soldiers and horses? Why was he the enemy of several other rulers? Why did he crown himself? Why did he travel to Egypt? Why did he invite several scientists?*

### Modelling

During the session, we explained the mental process of understanding a painting or an image. We taught the pupils to read a painting in a specific direction: from left to right, from bottom to top, from the central to the periphery or vice versa. Everyone could develop his own reading strategy. They were invited to watch a painting keeping their hand as if they were holding a telescope. Again, they had a lot of questions



Fig. 3

about the image of Napoleon as emperor. Before the analysis we asked them about their reading strategy. When one pupil explained his or her strategy, we asked the other pupils if they shared the same approach. From each reader's guide, we had some representatives. At the same time, they learned that you can look at the same object from different angles.

The next exercise had to be done on paper. Pupils had to sit down with a copy of the painting and write down words in blue and red. The words in blue were linked with their observation. The ones in red were connected with their interpretation.

With the second group, we worked in a different way. They were given the possibility to walk slowly to the painting and read it (fig.3).

While doing this they had to create 'smart' questions for a quiz afterwards. These ques-



Fig. 4

tions were written in their diary. In the meantime, the teachers walked around to check the pupils' reports.

Some examples: *Why is Napoleon sitting on a seat? Why are there bees on his cloak? Why is he alone? Why is there an eagle on the carpet? Why is he wearing a white cloak with black spots? Are the objects from real gold? Why is the painting so big? Where is it now? Why has he changed his hat for a wreath with golden leaves?*

### The feedback and the motivation

One child started to create a hat of Napoleon. It was a very attractive element. He received the floor to describe the hat in his own words and pupils had the space and time to ask him questions about the timing, the construction, the meaning and his next project. He asked us to take it with him during the ex-

cursion. We agreed and asked him to put on the hat each time when we wanted to explain something on the spot in a plenary session. It worked very well.

The teachers and the supervisors were surprised by the pupils' questions and intensive observations. It came out that they could create very long texts based on their experiences.

In the museum, we did another observation exercise too. Again, pupils had to observe a wax sculpture being part of an installation in which Napoleon and his staff were situated in front of the battle of Waterloo. One pupil was invited to be the sculptor and to model an imitation of this installation. Some pupils became part of the reconstruction (fig. 4).

The teachers and the expert challenged the pupils to collect words for a dictation based on their experiences during the sessions. 50 words were selected by the pupils. The average score



intensive observation followed by an interpretation) became a common strategy for the teachers and their pupils. We discovered that we are not alone in this vision. There is the international movement 'Slow Art Day' that promotes to watch art in a slow way. Researchers announced that people look at an art piece in a museum for 17 seconds only. Also, the Belgian neurologist Steven Laureys stimulates his patients to look carefully to art and compares it to yoga sitting in a lotus position (Laureys 2015).

## Conclusion

The decoding methodology is a real eye-opener for teachers and trainees and provides pupils with more satisfaction too. This methodology is real time consuming and a slow-motion activity. However, the outcomes are more relevant compared to classical methods and the involvement is stronger as well. Focusing on a specific mental process is for many pupils a very reasonable target. At the end of the process one girl (11) said: "We learned to look with our two eyes in a double way...".

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# Decoding the Disciplines in Pedagogy and further development of the methodology

Sandra Chistolini

[sandra.chistolini@uniroma3.it](mailto:sandra.chistolini@uniroma3.it)

Università degli Studi Roma Tre, Italy

*The primary purposes of this paper are to present the essential part of the work intended to understand what to teach with regard to specific academic disciplines and to monitor students' learning, to bring out the bottlenecks which hinder the achievement of knowledge and slow down the learning process leading to failure. European reports on the excellence of higher education highlight deficiencies to be defined and overcome, as well as possibilities for improvement also to adequately address the dispersion of students, often rejected in hidden and labyrinthine forms. The methodology refers to the impact of higher education on training in critical thinking. Results in passing the pedagogical knowledge using the seven steps of Decoding show how successful this approach is in teaching concepts, strategies, and procedures in Pedagogy.*

**Keywords:** Decoding the Disciplines, Pedagogy, teacher education, Erasmus Plus, diversity

## Introduction

This paper shares the application of Decoding the Disciplines methodology (DDm) in five scientific fields of University teaching training which are:

1. Teaching *General Pedagogy* (GP) in the first year of Teacher Education course.
2. Teaching *Pedagogy of Interculture and Citizenship Education* (PIC) in the third year of Teacher Education course.
3. Laboratory of GP aims to allow students to practice theoretical concepts presented while teaching GP.
4. Participation in Focus groups during the Multiplier event in which Intercultural and Interdisciplinary Approach to Teaching and Learning was a crucial point of the session of Decoding.
5. Teaching *Education research methodology* in the Ph.D. course in Theory of Education and Social Research. Moreover, it is relevant to mention the presentation of Decoding during national and international Conferences. In several scientific

- meetings, the introduction to Decoding generates a deep interest mainly because all disciplines have experience of student failure in passing the exams. Usually, University teachers are not happy with students' scientific performance and claim space to experiment Decoding the Disciplines methodology (DDm). Requests from teachers of veterinary, geography, physics are meaningful examples of the interest which arose from plenary discussions. As Pace (2017, p. 2) pointed out, a large number of students need the complex knowledge and teachers should understand their pedagogical responsibility.
6. Application of DDm in English class at the University of Macerata.

Decoding the Disciplines represents the current stage of development of the democratic vision of teaching at the university level with the introduction of a dynamic sequence methodology, based on the understanding of the discipline taught and learned in a classroom. The methodology seems to be very useful to answer

the challenge of the modernization of Higher Education as Vassiliou (2013) underlined.

The brief report of the Decoding application in classroom follows the style of a narrative protocol as a cultural approach to knowledge according to Bruner's studies (1983) on self and mind. In this paper presentation and results of DDm regard GP and PIC 2016-2018.

## The context of teaching and learning

Profiles of students in GP are students between 22-25 years old, males, and females, coming from higher secondary school. GP is their first year course of a university degree in Teacher Education which lasts 5 years. Upon successful completion, students will become teachers in Infant and Primary Schools. Usually they have no knowledge as to what is intended for GP as a university discipline and they complain about difficulties: a) in understanding proper disciplinary language, b) in using the contents of the discipline theoretically and practically, c) in managing the scientific style of the subjects with quotation of classics and contemporary Authors. Students in DDm class can range between 150 and 200 individuals, during the written examination they can even exceed 200. Lessons are not compulsory, and attendance cannot be replaced by the use of email, internet, PowerPoint production, Skype communication. Students trust Facebook groups as the main chain of communication. Usually, one student asks the professor and then the others follow, so there is a lack of searching for evidence in students' own way to find the source of difficulty. The tendency is following the group instead of thinking independently. In the Decoding, the teacher encourages them to interact using all devices without fear of asking questions. They really like workshops (Laboratory of GP) because it gives them the opportunity to visit new schools and the specific application of education today in the school system, in both formal and informal settings. Eventually, they quickly learn how to produce PowerPoint presentation thanks to the teachers' methodology called M.I.T.E. Multiple

Interaction Team Education. M.I.T.E. is intended to be a practical development on symbolic interactionism theory starting from Blumer (1969) and Denzin (1970) of social interaction as an explanation of how dynamic people in the specific situation of life helps to understand human relations.

Teacher's use of PowerPoint presentations for daily lessons and the website has always been of great help. In general, the teacher was happy about the students' efforts to do their best to keep the rhythm of the lesson and the course. The teacher thinks students show active participation. Concerning the 2 groups, focus and control, the teacher finds a benefit to using two hours with students with the application of DD methodology and 2 hours with students without application of DDm, the basic profiles are the same (Dec 2016). The benefit of the two hours was in term of having more time for the work in class.

With regard to the Semester in 2018, it is important to add that students are in their Second Semester of GP. In March 2018 the teacher's focus was on the bottleneck concerning the diverse attendance of the students and therefore provided a more present action using discipline in the interactive website, the student forum. The teacher allowed students to use all means to access resources and ask for clarification: telephone; WhatsApp, emails, Skype. In this way, the teacher was able to break through the wall of discipline.

- March 6, 2018 the teacher presented the curriculum of the Second semester and asked a few questions about the studies carried out between Dec 2017 and Feb 2018.
- March 12, Multiplier Event all students were requested to follow the streaming of the event.
- March 13, the teacher posed questions about students' study of the section of the curriculum.
- March 19, the teacher collected all questions and posted them on the discipline interactive website asking all students feedback.

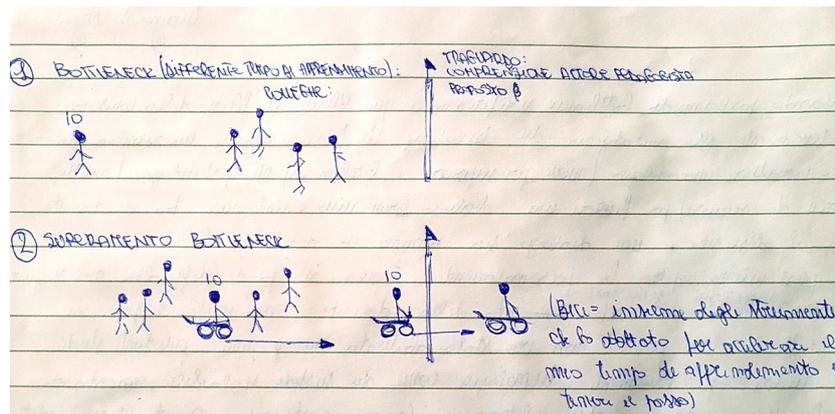


Fig. 1. In the student's words: "I found the Decoding methodology very useful. The discipline was clearer to understand the relationship between schools of thought. It would not have been so if I had studied independently", 4<sup>th</sup> May 2018. In this case the drawing shows an epistemological bottleneck

## Diversity Bottleneck

In March the teacher was glad to follow Decoding the Disciplines methodology looking for *diversity bottleneck*.

Diversity Bottleneck in the class of GP is diversity between students *who attend* lessons and can understand and make questions and improve knowledge and students who *don't attend*. The consequences are in terms of changing the way of studying and constructing a scientific open mind vision of education. Those who can attend have the opportunity to enter in a scientific discussion and form their critical thinking, because the class, atmosphere/climate/style in a university context, is different from the one the students already know from the experience matured in secondary school. Those who attend can be part of the innovation while those who do not attend cannot even figure out that the teacher is proposing a new vision of education.

Bottleneck: looking for the bottleneck in reading a book from the Classics and finding the useful message to renovate the concept of education becomes very difficult because the ordinary mental approach, the common tendency, is to simply summarise contents of the book. The teacher's request is that the students learn the main points of the Classic and

demonstrate these in an open class discussion that they make/infer deduction useful to renovate aims and tools of education in Primary Education, Infant and Elementary schools.

Planning: on March 6 students came in the classroom having read the classic and teacher explained the request. All students were to be involved even those who did not attend the lessons and were asked to give feedback via email, WhatsApp, telephone, skype focus group.

Diversity means the difference amongst students who attend and students who cannot attend for a variety of reasons. Many students live outside Rome and may not be able to afford to rent accommodation in the city. Also, many other students may not be able to afford travelling to Rome for classes and may need to work as well as to study. These factors prevent a large number of students from accessing learning.

This indicates that economic and cultural disadvantages dissuade many students to be fully engaged in their studies. Hidden within this is the situation of migrant students who are often also economically disadvantaged or culturally marginalized.

Students of GP asked for clarification on important concepts and knowledge by email and often the teacher had individual conversations

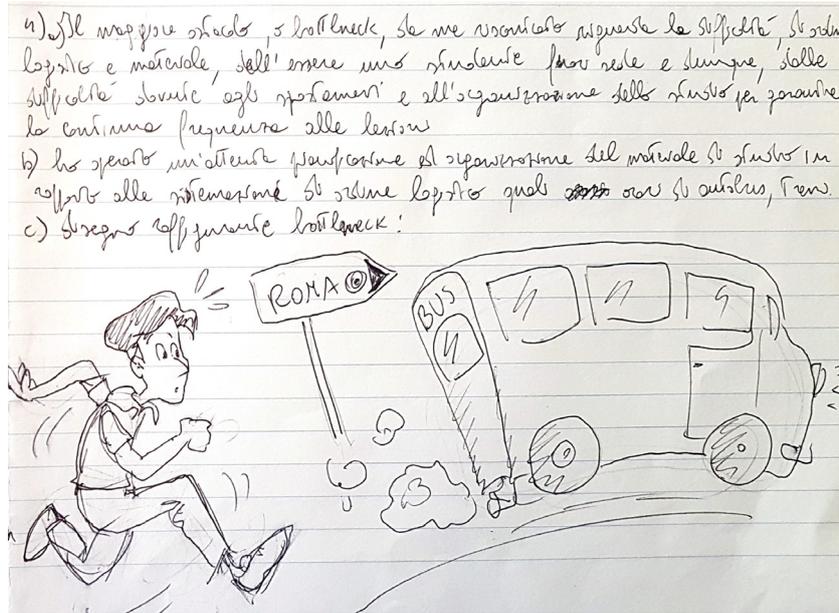


Fig. 2. Distance home-university. The student's drawing shows the idea of how it is important to consider the distance a procedural bottleneck.

and personal communications with each of them. The prompt answer of the teacher allowed students to follow the rhythm of the curriculum. A problem in GP is how to develop the necessary interactive methodology to follow

the discipline, arguments, tasks, evidence and make aspects of the curriculum accessible to all students who cannot attend so that they have a similar educational experience to those who can attend the class.

### Steps 2 - 3 - 4 of Decoding wheel

Table 1. Sequence of the Decoding process for steps 2-3-4

<p><b>Step 2: Mental Actions/Actions for engaging in learning/actions to facilitate access to learning</b></p>	<ol style="list-style-type: none"> <li>1. Students know the interactive website as a core aspect of curriculum engagement (this was identified in the first semester Oct-Dec 2017) then they need to identify the relevance of permanent communication and they need to identify their role in the interaction</li> <li>2. Important learning opportunities should be made accessible to all students.</li> </ol>
<p><b>Step 3: Model the Thinking/engagement/access</b></p>	<p>The teacher gave the students the equal opportunity of access to core aspects of the learning environment and curriculum through the discipline interactive website. Specifically, open access was possible with a) the questions of clarification that students ask following a class; a b) student forum, collecting questions emerging in the class; c) publishing questions and answers in the discipline interactive website.</p> <p>The process involved 3 actions:</p> <ol style="list-style-type: none"> <li>1. Students' questions of clarification by emails communication or telephone or WhatsApp. Often, these questions are useful to develop a deeper understanding of the curriculum content. Questions were available to all on the discipline interactive website.</li> <li>2. The teacher's answers to students' questions were available on discipline interactive website.</li> <li>3. Teachers' answers were the channel to model the important ways of thinking about the curriculum content.</li> </ol>

<p><b>Step 4: Practice and Feedback</b></p>	<p>At the end of each week:</p> <ol style="list-style-type: none"> <li>1. Students' questions of clarification were available on discipline interactive website.</li> <li>2. Teachers' answers to these questions were available on discipline interactive website.</li> <li>3. The teacher sent emails to all students to remind them that questions and answers were available on discipline interactive website and asked those students who could not attend classes to eventually email back other questions of clarification.</li> </ol>
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The creation of a discipline interactive website was characterized by the active presence of the teacher:

1. as administrator
2. posting material, documents, questions, questionnaire, comments, Youtube links
3. publishing the classroom interaction through questions
4. opening a forum with the students
5. allowing students to give feedback for each section of the curriculum
6. making sure that students know they are equal in terms of curriculum targets
7. modification of the interaction
8. organization of focus groups
9. posing students questions about curriculum
10. sharing steps of DD methodology process.

Before the class, the teacher gave the students to read a book from Classics (e.g. Rousseau, Montessori, Dewey) and asked them to present their study in class. Each student had a different book title, in order to promote dialogue, comment, participation. The criteria for reading the book were a) focusing on the main argument related to Pedagogy Education Formation Teacher vocation and mission; b) explain the cultural context of the Author; c) finding meaningful words for the pedagogical discourse; d) clarify the language of Pedagogy as different from the language of Psychology, Sociology; History; Philosophy.

Methodology: a) the book had to have been borrowed from the Public Library to show the

ability to search it; b) each student said in advance whether they would present their subject alone or in a group; c) teacher formed the team according to:

- single Author studied,
- group of students with the same Author and diverse books of the same Author,
- school of thought (e.g. Empiricism, Positivism, Idealism, Pragmatism),
- theme (e.g. Nature, Culture, Language, Values, Democracy).

The presentation could have been oral or in Power point, individual or shared in the couple. Before each presentation, the teacher posed 1 or 2 questions, no more, to prevent panic and be sure everybody could answer. After the student presentations, the teacher integrated the contents.

Finally, the other students, those who did not present, entered the discourse by posing further questions or by asking for some explanation. If none emerged from the class, the teacher casually assigned the student the task of interacting orally with questions, comments, connections, critical thinking. The teacher's interaction was: oral; power point; questions; contents from one reference book and the books of the students.

## Classroom

The first time (6<sup>th</sup> March 2017) the teacher was not happy with the students' interaction. They were too passive and were listening with no reactions at all. Talking to each other

and excluding the teacher, teaching and lesson from their interest.

The second time (13<sup>th</sup> March 2017) the teacher analyzed with the students the problems and asked them to propose solutions. For instance, instead of presenting the Author from the Classics for 15 minutes each, the class group decided to cut the time and organize the presentation in a synergic way: each student should follow the colleague and understand when, why, how to take the word and continue.

Each student could prepare 20-30 slides to summarise the book but in class, they had to select the most important slide (1 or 2) to match together in order to explain the main idea of the Author.

The third time (20<sup>th</sup> and 21<sup>st</sup> March 2017) the interaction was very good.

New difficulty: time!

DD Steps applied:

1. Identify a bottleneck to learning
2. Uncover the mental tasks needed to overcome the bottleneck
3. Model these tasks
4. Give students practice and feedback
5. Motivate and lessen resistance

Summary of DDm from 6<sup>th</sup> to 21<sup>st</sup> March

- The teacher gave the students the feedback of the questionnaire in 4 slides with a selection of typical responses. (DD 1-4)
- The teacher asked them to summarize the meaning of What I know + Activities already K + What I will + Activities I will K. = in one logical narrative phrase and keep it as their own memory. (DD 1-3-4)
- Teacher and students saw sections of the film of 6<sup>th</sup> March and the teacher asked about the identification of the problems. (DD 1-4)
- The teacher encouraged the students to "identify the problem". (DD 1-3)
- The teacher asked them to write the problems during teacher's exposition and class interaction. (DD 2)

- Students showed a keen interest. (DD 5)
- The teacher gave the students the feeling that she was very happy with their answers: well done! (DD 5)
- The teacher explained the relevance of being able to "identify the problem" as a tool for future teachers and as part of the profile of the teacher. (DD 5)
- The teacher announced the class would have a new film on 20<sup>th</sup> March with student presentation and they would be filmed. (DD 4-5)
- On 13<sup>th</sup> and 14<sup>th</sup>, March the teacher prepared the students to present their study in a functional way caring for the interaction with their colleagues according to the themes.
- The interaction on 20<sup>th</sup> and 21<sup>st</sup> March was good, students did not report difficulties in term of content. Problems were in terms of time. Not all students could present their book as planned.

Two videos for GP (Human Science) and two videos for Mathematics (Natural Science) are documents of the applied Decoding Disciplines methodology.

Decoding Bottleneck Sandra Chistolini Pedagogy 06.03.17 <https://youtu.be/0z2QL-3KJgE>

DDm Decoding the Disciplines Steps 2-3-4-5 Sandra Chistolini Pedagogy 20.03.17 <https://youtu.be/ANjGXk9Fgz4>

Decoding Bottleneck Paola Supino Math 06.03.17 <https://youtu.be/thKKh2HY-ls>

DDm (Decoding Disciplines Methodology) Steps 5-3-4-5 Paola Supino Math 20.03.17 <https://youtu.be/k3dZch1sbmU>

In the two videos, published on Youtube, public access, there was a group of students of the GP course, which is also the sample for Mathematical Institutions. The choice of the two disciplines responds to the humanistic and scientific classification of university courses. Inbound and outbound questionnaires were identical for the two disciplines.

Step 6 was the final examination of June and September 2018.

Step 7 was the Multiplier event in which results were shared and new teachers started DDm.

Comparison was made for three years 2016, 2017, 2018 with pretests of October, middle term tests of March and post-tests of June–September. In 2016 we did not use DDm, in 2017 we stated the application of DDm and in 2018 we completed the application of DDm. Teacher recorded an ascending parable of successful qualitative results and descending parable of quantitative results. It means that students understood they were required to define bottleneck properly and this awareness guided them to take time to absorb the new and unusual demand of the teacher. As Middendorf and Shopkow (2018, p. 177) suggest assessment was possible collecting written answers of the students and their representation of the bottleneck from the definition, step 1, to the final sharing of the knowledge step 7. From this point of view, the initial situation of October 2018 in which student should give feedback

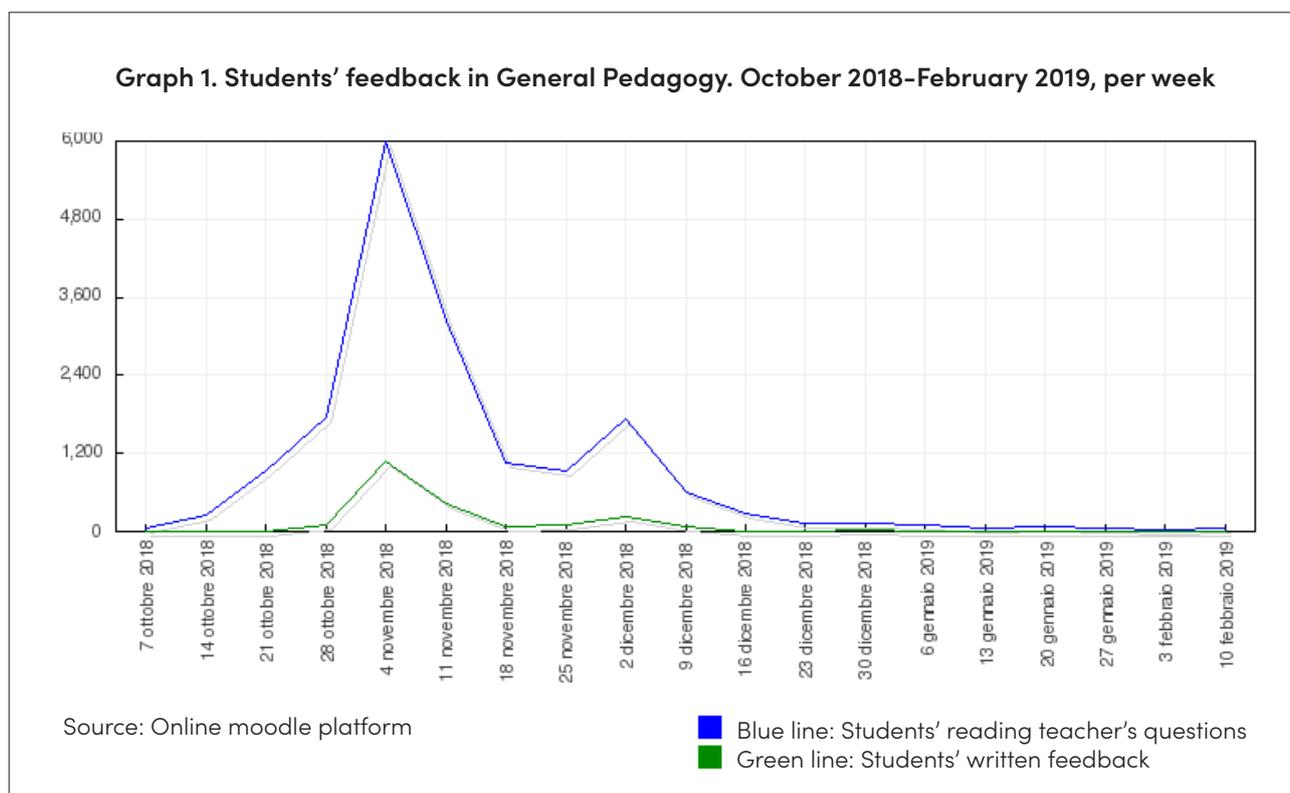
about step 1 can be compared with the final situation of Dec 2018 when students received teachers’ assessment as step 6.

Graphs 1 and 2 show student feedback collected on the online platform. The graphs show how the interaction of the students is very high in terms of reading the teacher’s questions, step 4, instead the written response of the students is weaker: the students prefer to read but do not like to respond in writing.

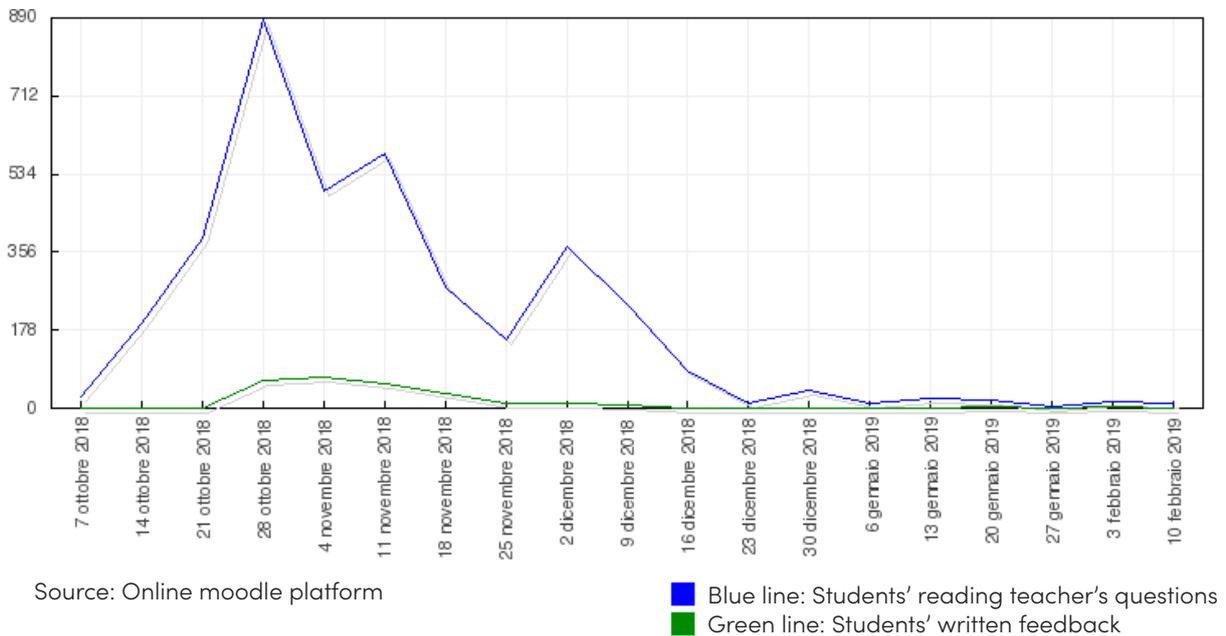
From Nov to Dec 2018 the action of step 5 was to motivate students for a written work to be prepared for the Dec 2018 exam.

On Dec 2018 PG assessment test of 183 students, 61% of students were able to describe the problem and 39% of students could not. Amongst the 61%, there were 48% who gave generic arguments and 13% able to specify the nature of the problem posed.

On Dec 2018 PIC assessment test of 59 students, 70% of students were able to describe the problem and 30% of students could not. Amongst the 70%, there were 29% who gave



**Graph 2. Students' feedback in Pedagogy of Interculture and Citizenship Education. October 2018- February 2019, per week**



generic arguments and 41% able to specify the nature of the problem posed.

### Comparison of two semesters

In Italy, we first applied DDm during two semesters March–May 2017 and Oct–Dec 2017 and we could provide for qualitative and quantitative results. Qualitative: meaning the sentences written by the students who gave their evaluation of the DDm in studying the disciplines. Quantitative: meaning the success in passing the exams with much better marks, better marks means they were able to solve initial difficulties and had the feeling of understanding and learning new knowledge, giving proper feedback.

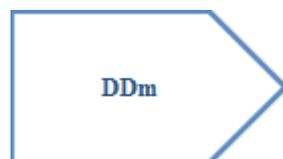
Our basic comparison about the diversity, according to our Project, was focused on the diversity between students who attended the les-

sons and could receive benefit from DDm and students who did not attend the lessons and did not develop a DDm mentality. All have the right to pass the exam. The number of our students is 300 individuals per course, only 50% are attending classroom lessons. Consequently, the problem is to reach all and give all the equal opportunity to learn.

*Qualitative.* The differences are substantial in terms of pentagonal image.

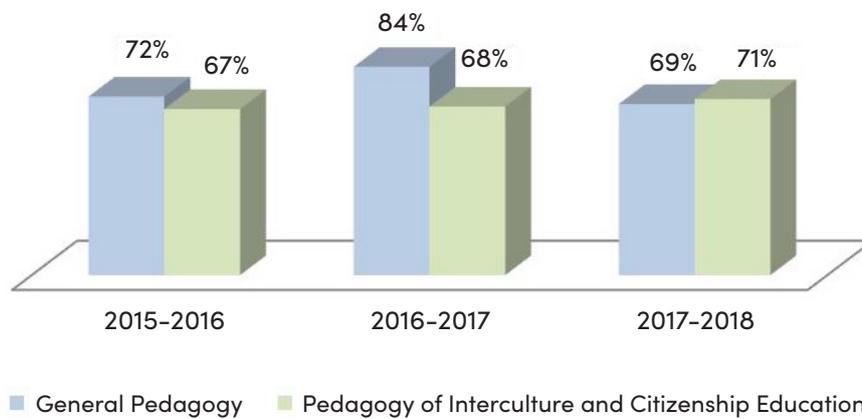
The five moments of the students' process of learning are:

1. succeeding in their university career collecting, highest marks in evaluation and curriculum targets;
2. maturing a sense of learning satisfaction;
3. developing awareness of the importance of DDm for their own career and for their future profession as teachers;



**Fig. 3. Pentagon image of student academic success in five moments of the process**

Graph 3. Final exam successful students, 2016-2017-2018



4. describing the theoretical connection with the best practices to contrast the early school leavers tendency, which is a critical issue in our context;
5. understanding the relation between DDm and values of democracy, equal opportunity, social justice, freedom in learning and teaching.

The Pentagon image gives the idea of the five moments of the Decoding process in terms of Description of the process of Decoding as effects of building the teacher profile.

Students who succeed in the learning process reinforced their choice to be a teacher and become more confident in the opportunity given by University qualification.

*Quantitative.* In percentages

- 90% of students who had the experience of DDm in classroom lessons completed the objectives of the course;
- 10% of students who had the experience of DDm in classroom lessons did not complete the objectives of the course;
- 40% of students who were introduced to DDm in distance learning completed the objectives of the course;
- 60% of students who were introduced to DDm in distance learning did not complete the objectives of the course.

In the June 2018 examination of GP out of 300 students, 69% were successful in the final exam, of which 50% attending and 40% not attending classes. Factors influencing this result depend on: a) the scarce organization of the student own work; b) the tendency to postpone the exam which is due in the first year of course; c) forgetting to read the tasks that the teacher gave at beginning of the course; d) the weak participation in the entire process of learning which goes from October to May; e) the under evaluation of the pedagogical responsibility of teacher and student; f) the absence of rhythm in learning process.

*Perspective.* In September 2018 examination of PG, DDm target was reached with 100% of success: 70% of the success of students who had the experience of DDm in classroom lessons and 30% of the success of students who were introduced to DDm in distance learning.

Concerning the discipline PIC, there was an increase of successful students' final exams.

*Conclusion.* In 2016 and 2017 the number of students who failed the exams of July and September was around 30% which corresponded especially to those who did not attend classes. Between June and September 2018 that 30% moved to the group of those who passed the exam.

*Dissemination:* Student Conference Multiplier event in Rome 12 March 2018, we received almost 100 participants: 63% of students and 37% of teachers, head teachers, experts. The quality of the meeting was very good in terms of the application of DDm and the intention to involve students 17-18 y.o. attending secondary school.

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# Decoding Disciplines.

## Applying the methodology to high school

**Patrizia Bruno**

[patrizia.brunoo@gmail.com](mailto:patrizia.brunoo@gmail.com)

*Istituto Benedetto Da Norcia, Liceo Classico e delle Scienze Umane, Rome, Italy*

**Nadia Petrucci**

[nadia.petrucci@istruzione.it](mailto:nadia.petrucci@istruzione.it)

*Istituto di Istruzione Superiore Confalonieri - De Chirico, Rome, Italy*

The article summarizes the results of the debate held at the University of Roma Tre involving students, teachers and directors from different levels of school in applying the Decoding the Disciplines method: the comparison with the results obtained from the application of the method in the university world has shown, in addition to some differences, important similarities, which show that the essential problems of learning are the lack of prerequisites, the difficulty in communicating between teachers and students and the distance between learning and real life.

**Keywords:** demotivation, educational relationship, competences, learning process, team work for teachers

### Introduction

All school teachers encounter the same difficulties in their daily work: it is enough to confront each other within the disciplinary area meetings to verify the presence of certain nodes that effectively prevent students from continuing successfully in their learning path. The main obstacle that demotivate the teachers in their work is feeling alone in dealing with these difficulties, so it was very stimulating to be invited to discuss it together with a group of students and a team of university teachers who deal with a methodology aimed at addressing just these problematic knots, called bottlenecks.

### Decoding and Bottlenecks

Working groups were formed during a debate on 23/03/2018, each one including a uni-

versity lecturer or subject expert, one or two high school teachers, and at least three students. Among the main bottlenecks identified, demotivation in studying was highlighted, claimed by students to be caused by difficulties encountered in identifying a practical application of the disciplines, taught mainly in a theoretical and abstract form. Although our school tries to offer an education focused on students' interests and uses learning by doing methodologies, we continue to observe this kind of problems in the practice of learning.

The debate regarding the challenges of the educational relationship between teachers and students highlights the primary problem of frustration in studying. Students often mark the profile of a school where teachers are unmotivated, repeating content which remains distant from the required goals, where their pupils are seen as a group and not as a set of individuals.

The didactic communication appears to be indifferent to the scholar's needs and unable to share pursued goals; the educational path adds nothing to personal skills, and more importantly, deceives the initial expectations of students. School does not build competences, as it is more focused on respecting the 'scheduled assignments', forgetting how important it is, for the learning process, to raise the interest and motivation of students to build those aptitudes that fulfil the Lisbon Competences.

The professional institutes also show an inability in developing the skills required by a job market that is continuously evolving. Amplifying the debate to high school<sup>1</sup> and comparing the conclusions with those of university learning<sup>2</sup>, some common bottlenecks emerge:

- Lack of useful prerequisites necessary for text comprehensions (specific lexical skills, complex syntactic constructions, implicit cultural references);
- Lack of a connection between theory and practice of the learning process;
- Separation between scholastic studying and real-world life.

To all of those aspects, in high school, we must add the emotional ones, responsible for conditioning the student-teacher and student-student relationships as well as creating confusion between personal relationships and professional communication. What happens is that students do not feel able to formulate and ask questions and interact in a constructive way. Furthermore, the difficulties of operating collectively in a team, is another bottleneck for teachers, resulting in them not being competent enough to manage and teach to the students the ways of a constructive interaction.

Applying the Decoding method, in its analytic function, helps to separate and distinguish the emotional stresses caused by teenagers from procedural and epistemological issues of the didactic communication, bringing back the relationship between the student and the school environment to its interactive function, whose purpose is the formative interaction and the making of the student able to find out their critic points (using K questions and W questions), but also evaluating and orientating their track (using L and S questions)<sup>3</sup>. By doing so, schools are able to face the impotence and sense of inadequacy which emerges from the debate with the students. However, adequate training and ongoing support is necessary for the teachers, in order to pursue this goal.

## Conclusion

This experience led to an in-depth study of these issues within our school, which now also involves a group of teachers of various disciplines and, hopefully, over the next few years, can start a study parallel to that conducted in the academic field, to better understand the advantages of this methodology in addressing the learning difficulties of our students. In particular, in the Italian school, which is moving towards the development of individualized study plans, it is important to be able to identify quickly and correctly the weakness and strengths of each person in order to guide each school's choices and life choices.

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1 The I.I.S Confalonieri-De Chirico includes High School, Technical and Professional Institute, Adult Learning.

2 Chistolini, S. (2017). Decoding the Disciplines in *Pedagogia: epistemologia e metodologia della formazione per una buona pratica di preparazione universitaria degli insegnanti. Il Nodo. Per una pedagogia della persona*, 21(47) 35-52.

3 About K-, W-, L- and S- questions see Chistolini, 2017 cit., pp. 44-46.

# Decoding the Disciplines in higher education institutions and democratization of knowledge to contrast the gap between cultures

**Sandra Chistolini**

[sandra.chistolini@uniroma3.it](mailto:sandra.chistolini@uniroma3.it)

Università degli Studi Roma Tre, Italy

**Hugo Verkest**

[hugo.verkest@vives.be](mailto:hugo.verkest@vives.be)

VIVES University of Applied Sciences, Belgium

*Decoding the disciplines is a European project under the framework of Erasmus + KA2. It represents the current stage of development of the democratic vision of teaching at the university level with introduction of a dynamic sequence methodology, based on the understanding of the content of discipline taught and learned in classroom. All disciplines are involved: humanities, arts, sciences and social studies including citizenship education. The priority purpose is to understand what to teach about an academic discipline and to monitor students' learning and motivation, to bring out the bottlenecks, which hinder the achievement of knowledge and slow down the learning process leading to failure. Knowing how to teach at university requires to integrate the new monitored European key competences. Not all university teachers have the opportunity to follow an adequate teaching education, nor can they directly verify their ability to know how to teach and communicate the knowledge and the epistemological character of their discipline. The growing disciplinary gap between teacher and students assumes the shape of progressive removal from scientific truth. The theory of humanistic Weltanschauung guides to think the qualification of a teacher in terms of responsible participation in building the identity process. The methodology in 7 steps refers to the impact of higher education on training in critical thinking, mainly in Belgian and Italian citizenship education, and notes the current important scientific acquisitions, with the eventual design of extension of the training of secondary school teachers. The project is coherent with the Council of the European Union of May 12, 2009 Conclusion, "ET 2020" and will use Open Educational Resources (OER). Decoding citizenship education will lead us to new horizons and challenges. Presentation of initial results aims to receive a feedback on our still in progress study or our work in progress.*

**Keywords:** Decoding, democracy, citizenship, education, motivation

## Introduction

The mission of the University is to prepare new generations to be face the world in terms

of knowledge and in terms of competences. The process of education intends to promote cultural progress and economic development in students able to build a closer relationship be-

tween knowledge heritage and improvement of living conditions. Political and social implications are part of the university teaching where it becomes urgent to adjust the agenda to the widespread idea of the European recommendations symbolised by the triangular growth of intelligence, sustainability and inclusion.

Students should be guided to the awareness of the assumption of their responsibilities towards mastery learning. The methodology called Decoding the Disciplines imported from Indiana University (USA) represents a new device on how to study, internalise, interpret and create solutions in learning and teaching process. Teachers, in schools and University contexts develop the capacity to communicate the students the discipline, any kind of discipline, using learning dialogue in a way that the lesson transforms into an existential project, in which to believe and to which one commits oneself. It is a sort of revolutionary thinking perspective of teaching and learning. Teachers reassume their specific field of expertise and students invest in their skills to understand contents and methods.

Decoding the Discipline is an interactive teaching model which can be realised in differentiated learning environments, humanistic, scientific and in digital technologies. The profile of teacher using Decoding the Disciplines methodology is focused on the ability to uncover bottlenecks and obstacles, encountered by the students in the classroom.

Human contact between teacher and learner allows students to express their difficulties regarding the object of knowledge during the learning process concerning a specific discipline. This human contact sets up a significant educational relationship that results in successful preparation.

Relevant studies about the human factor in economics restore vitality and responsibility to the person recognising the top position of the human being, while monetary earnings is just the engine of change depending on the acting person (Levinas, 1987; Burggraeve, 1997).

The international comparison of the applied methodology found in the Erasmus Plus project the better context in which it is proved the efficacy and consistency of Decoding the Disciplines methodology.

Meaningful aspects of European cooperation on the theme are presenting in this paper aimed to change and develop superior systems of instruction and training in the sense of democracy and participation in sharing the academic and scientific knowledge. Decoding the Disciplines is interpreted as preferred path to cut down on university drop-outs and to prevent situation of study exclusion.

### **European goals and the question of academic world ranking**

In the Agenda 2020 called ET 2020 the primary goal of European cooperation should be to support the further development of education and training systems in the Member States which are aimed at ensuring the personal, social and professional fulfilment of all citizens, and the sustainable economic prosperity and employability, whilst promoting democratic values, social cohesion, active citizenship, and intercultural dialogue (Council, 2009).

The contents are also part of the worldwide objective on the entire system of planet Earth and on the extension of employability on the international market. Young people are prepared to look beyond national borders and choose places of work, in which their competences can be fully recognised.

Europe 2020 emphasises three interconnected priorities: 1) intelligent growth that means development of an economy based on knowledge and innovation; 2) sustainable growth through the promotion of a more efficient economy from a point of view of resources; 3) inclusive growth intended to promote an economy with an employment rate high enough to support social and territorial cohesion. Three areas of action for achieving these priorities are indicated hereafter (Applica and Ismeri Europa, 2016).

The first concerns innovation and refers to European spending for research and development, still at 2% in 2010 and, thus, below the percentages recorded for the United States (2.6%) and Japan (3.4%); the auspice for Europe is moving in the direction of increasing investments in the private sector and high technology.

The second area of action is that of education, training and lifelong learning and directs new attention to students with limited reading capacities, youth who leave their studies at an early age, that is, the 50% who have an average level of qualification that often does not meet the job-market requirement. Of note, on the whole, is that, in Europe, a university degree is obtained by less than one person out of three, at the age of between 25 and 34, whilst in the United States, under the same conditions, this factor is 40% and 50% in Japan.

The third area of action, towards which Europe is moving is that of the digital society, in consideration of the fact that the global demand for information technology and communications represents a very extensive market, in which the participation of European businesses is still scant, due also to the delay in the use of high-speed internet. The slowness of on-line communication hinders innovation, particularly in rural areas, the spread of knowledge and distribution of goods and services.

## Teaching as the learning environment

The *Times Higher Education World University Rankings 2019*, released on 26 September 2018, has revealed the world's top universities and indicated two British universities and one US university among the top 10 (Oxford, Cambridge and Stanford University). The five categories under which each university is judged to cover the core missions of all world-class, global universities are: teaching, research, citations (research influence), industry income and international outlook.

The World University Rankings assumes that teaching is the most important factor in learning

and develop knowledge. The crucial question concerns the students learning environment at the university. It clearly appears that the quality of teaching depends on the quality of research in terms of production and transfer of knowledge. The measure refers about five performance indicators: a reputation survey, the ratio of staff to students, the ratio of doctorate students to undergraduate students, the number of doctorates awarded per academic staff, and institutional income. The consequences of the five indicators are a good prestige, availability of facilities and resources of the teaching environment. Students receive a direct impact and learn effectively and efficiently.

## A methodology for university teaching

The concentration of critical thought on the subject of study has led to working up the methodology of Decoding the Disciplines. The attempt to help students learn how to analyse, summarise and assess could meet with obstacles in the building of a higher order of thought, due to the gap created between the degree of thought required in the classroom and the generic assumptions being introduced. To prevent and overcome these difficulties, the relevance in facing the issue within each special field of discipline is emphasised. The general reference structure represents the epistemic, cognitive and emotional framework of the process, completed by the specific, in-depth examination of the discipline.

According to the reconnaissance of John Middendorf and David Pace (2004, 2017), we can define a development typology of the new methodology in the academic world, starting with the studies of Shulman, Brown, Collins, Duguid, Tobias.

Lee Shulman (1987) sustains that teachers' training must pass from general theoretical proposition to the study of learning in environments created by disciplinary teaching. Other academics (Brown, Collins, Duguid, 1989) talk about "cognitive apprenticeship", as the process of learning academic disciplines compared to learning various functions in a foreign culture.

Observations in the field (Tobias, 1992–1993) reveal the difficulties of even expert educators and qualified students, under conditions of transferring into inferior teaching environments, far from their own specific disciplinary competences. This is a clear sign that possessing the discipline requires adjustments to the environment that cannot be given solely in the form of the general theory of learning.

This defines the fundamental epistemological problem that one needs to try to dissect and comprehend on two analytical planes: the plane of theorised knowledge and the plane of the discipline taught. The questions that await replies are related to the structure of the knowledge and methods, with which the experts reflect within their own disciplinary field. The gap between what is thought about the discipline and what the student learns constitutes a subject of investigation and in-depth scrutiny. At this time, there seems to be a certain convergence among the various disciplines in the sense that each discipline finds a separation between the culture of discipline of the teacher, supposedly very well-known, and the culture of the discipline of the students, supposedly very unknown.

The humanities teacher and the science teacher are facing the issue of the abyss that is being created between what the professor teaches and what the university student learns.

## Learning process

Researchers, who are interested in studying the nature of the discipline, who teach by monitoring the results of the students, show a great responsibility towards the social and cultural implications of teaching. They truly want to know what remains of what they teach, and the evaluation of the feedback relative to the mastery of the knowledge by the young people is considered an indispensable step towards improving the performance of both parties: teacher and student.

The often unsatisfied comments of the teachers about the way the students give their feedbacks on the contents of the discipline heighten

the search for quality of the educational offer. To improve one's own teaching method, one can start from various tracks. No matter what the case, to scientifically study thought and learning, it is necessary to link the disciplinary knowledge to what occurs with the students in the classroom. There are teachers with excellent knowledge, but who are actually unable to communicate the contents of their own discipline and, vice versa, there are teachers who were not considered exceptional as students, but who are masterly experts in getting students to participate in a work plan, through which learning takes place in a natural, spontaneous, easy, painless, interesting and pleasant way. The attraction to the discipline is not only linked to the contents, but requires that bit of curiosity, without which the contents, learned quite rapidly at the time and solely for administrative purposes, are just as quickly forgot. Not a remnant is left in the mind or heart of the student.

On the basis of the methodology, there are three principal assumptions that change the way of conceiving thought on the best performance of the students and establish a new learning structure characterised by interaction and dynamism among persons, knowledge, strategies and results.

The first assumption concerns specific disciplinary learning; it is found that every fact learned can be localised in the individual discipline and does not concern all the disciplines; at first, it affects the specificity of each discipline and the disciplines neither superimpose nor mix with one another. The second assumption concerns what students have to do and do not know, the doing not the knowing, the concepts are derived from mental operations. The third assumption is represented by the fact that teachers imply some information and render important passages that are invisible to the students, but necessary for understanding the task.

The starting principles from the three assumptions are derived from setting up the decoding process composed of seven steps of involvement, which the teacher follows as a guide for each discipline.

The seven steps of decoding are: 1) identification of the problem areas through research that is alert to the so-called bottlenecks, that is, a place where many students consistently fail to master crucial material; 2) definition of the mental operations deemed crucial for training students to complete the assignment and, thus, overcome the bottlenecks; 3) modelling the passages, going into detail of what to ask the students; 4) preparation of actions to conceiving the steps that the students have to perform in practice and the feedback on the process; 5) examination of the reasons and the emotions of the students, so that they go through the decoding process and realise the difficulties; 6) analysing the mastery the students reach over the course of the various steps through the preparation of assessment tools; 7) sharing what has been learned.

The steps are presented as a general structure for confronting the general problems of learning and are not an inflexible model to be applied dogmatically in the action of teaching. In fact, the sequence may change, depending on the situations being examined. For example, one could actually start from the second step rather than the bottleneck and continue with the sixth step, then return to steps three, four and five. Sometimes the seventh step, of sharing, and even the fifth step of reasons, have to be put off. These decisions concern the category and method for applying the paradigm. In any case, the crucial issue is that of the attention on what to do to allow the student to be successful in the university course. The presence of trained tutors and constant supervision are essential for the success of the entire process.

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# Developing inclusive policies in the education system. The possible contribution of Decoding the Disciplines

Milena Pomponi

[milena.pomponi@uniroma3.it](mailto:milena.pomponi@uniroma3.it)

Università degli Studi Roma Tre, Italy

*This contribution aims to reflect on how effective a role the methodology of Decoding the Disciplines could be in the perspective of inclusive policies of the education system. The reasoning starts from the framework of European and national school policies inviting the education system to reflect on cultures, practices and inclusive policies. The latter are fundamental because they allow us to pay attention to the contextual factors and to the functioning of the methods of conducting and managing the governance of the education system. The impact of Decoding the Disciplines methodology is then analysed not only on the level of the teaching-learning process but also on that of the organizational-managerial and educational-didactic processes of the education system.*

**Keywords:** inclusive policies, Decoding the Disciplines, assessment, reflection, improvement

## Introduction

Educational and training agencies, such as the School and the University, are the institutions dedicated to the educational success of the students and to the development of the identity of the human person in its entirety. They are called to respond to new cultural and social challenges, decisive for the development of the Knowledge Society: to be responsible for learning, to promote methodological-didactic innovation and to promote democratic citizenship.

In this perspective, the European school policies, aware that investing in training and human capital is the only strategic lever for the development of the whole person and for the real progress of the country, have emphasized priority objectives established at international level in three documents which are: *Education and Training 2020 (ET20)*; *2030 ONU Agenda*; *Recommendations 2018 for new skills*.

The Italian legislation, in turn, has implemented the European requests and has integrated these objectives through various legislative interventions, such as Law 107/2015, the subsequent Legislative Decrees and the New National Guidelines 2018, through which it is invited to reduce inequalities and to prevent and combat early school leaving by encouraging reflection on cultures, practices and inclusive policies.

## Theoretical background

In this context the research doctorate project was developed, entitled "Inclusive Policies: the school as a participated community and professional development mediated by the agency". The inclusive policies (Bocci, 2018), in the sense of the organizational forms of the educational institutions in their singularity and in their networking on the territory, invite to reflect on

the use of effective and inclusive organizational and educational practices, aimed at making the organization and school planning flexible and effective, positively influencing the teaching-learning processes.

This is a fundamental approach that finds in the current legislation a practical impact on the practices of self-analysis and self-improvement to which schools are called (ex: Self-assessment Report -RAV- and the Program Improvement Plan-PdM-), documents that if used according to a philosophy of participation and sharing can represent a driver for the development of real inclusive processes of the school system, both locally and nationally.

In this sense, the Decoding the Disciplines approach may be useful as a model for further comparison.

As we know originates from the Mastery Learning (developed by Bloom, Block, Anderson and others since the Fifties of the last century) and is configured as a methodological process, subdivided into steps, which allows for a progressive decoding (Chistolini, 2017) of the discipline by which the difficulties are surfaced, awareness of the obstacles is realized and strategies are redesigned to deal with the gaps that have emerged in order to improve student results. In particular, the Bottleneck step acquires value, which students, with the teacher co-participation, to bring out the difficulties and to resort to the use of critical thinking and reflective attitude: teachers can re-program teaching activities and methodologies strategies; students can redirect study methods, commitment and participation.

This methodology, therefore, helps to acquire the awareness of the existence of difficulties in relation to the teaching-learning process that involves the teacher and the students. However, if it were oriented in the perspective of inclusive policies, it could help to bring out the difficulties related to decision-making processes that underlie the organization and management of the school system, which involves all teachers.

The Decoding the Disciplines could, therefore, offer a functional contribution to the perspective of inclusive policies. When critical issues are highlighted at the level of governance, it would allow the teachers to monitor and manage the control of the organizational-managerial and educational-didactic processes, orienting the re-design of the same processes in order to implement improvement strategies. This involves initiating, at the level of the decision-making processes, moments of co-participatory reflection on the way of conducting the same processes, in order to confront and understand how they co-act with respect to the difficulties, if the latter are shared and if the modalities of resolution are co-participated. On the operational level this methodology, for example, could be functional if applied to the participation practices related to the self-assessment and improvement of the school system, such as the Self-assessment Report -RAV- and the Program Improvement Plan-PdM-.

## Conclusion

The Decoding the Disciplines approach thus launches a dual challenge to the education system in renewing itself: in terms of quality of the teaching-learning process but also in terms of organizational-managerial and educational-didactic processes; the latter are considered fundamental because they lead to choices regarding teaching methods, tools, evaluation and self-evaluation process and training for professional development of teachers.

Finally, it is essential to stress the importance of teacher training in the framework described. In fact, it means reflecting on the training offer and on the methods for providing training and teacher involvement, with a view to professional development. The latter frames itself in a framework that involves emerging issues, not only at national but also European level and international; and the teachers of the scholastic and academic system but also students, future teachers involved in university courses.

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# Decoding the Disciplines: theories and praxis

Luisa Ester Felicetti

[luisaesterfelicetti@virgilio.it](mailto:luisaesterfelicetti@virgilio.it)

*Istituto di Istruzione Superiore "Giovanna De Nobili", Catanzaro, Italy*

As part of the Erasmus Plus KA2 action program, the "Decoding the disciplines in European Institutions of Higher Education" was realized. For Italy, the program - scientific coordinator Professor Sandra Chistolini - involved the University and secondary schools.

**Keywords:** digital society, human sciences, school students

## Introduction

The student generation of the third millennium is identified as "Digital native"; Neuroscientists have defined young people to be carriers of a "brain" with a parietal lobe modified since birth because of the influence that computer media exercise. We are therefore, in the presence of students who think, act, relate, express themselves in the family, at school, in society, with models that are different from those of the twentieth century, which, conversely, adhered to a classic, traditional scheme.

The excessive use of information technology, computers, tablets, mobile phones, video games, has transformed the ways of being of the new generations, now increasingly in contact with an expanded reality, inclusive of the virtual, defined by the term "coding", which indicates the learning of "programming languages". Although useful and necessary in a global, technologically advanced society, these latter risk to eradicate the person from the social and cultural context, move generations away from the traditional culture that allowed the improvement, the progress of a company in continuous transformation, open to rapid changes and has allowed the same generations to face changes, adapt and offer solutions. The new age, often submerged by telematic means, sometimes unable to distinguish, fragile, condi-

tioned by what has been called "digital society", is in the most important period of development of life (fourteen to twenty-five years) disoriented about how to live and act, because often it is not able to correctly read the reality, to think critically, to offer constructive contributions, because it is increasingly carried to consider only fragments of reality.

It is therefore necessary to use methods and strategies that are able to avoid "blocking", the stalemate that could lead society to a blackout that is so dangerous as to glimpse a possible social, political and economic regression. It is no coincidence that we are talking about the risk of having to live a "new feudalization" in the coming decades, with a mass society represented by robot-men. Therefore, we must not underestimate the phenomenon, which is under the eyes of everyone and especially those who every day are in constant contact with students in schools of all levels and levels of education.

The need to recover critical thinking and enable the person to correctly read reality and distinguish it from the virtual seems to be today a priority in every institution, starting from the family whose constitutional duties towards the children are dictated by the Article 30 of the Italian Constitution. In particular, the institutions should all have priority to insert in the programmatic agenda and in the work plans projects to solve

this problem in the process of democratization, never interrupted in the western societies.

The objectives of the European strategic framework 2020, confirmed also for Europe 2030 include the full personal, social and professional fulfillment of all citizens, sustainable economic prosperity and employability, the promotion of democratic values, social cohesion, active citizenship, intercultural dialogue, global education, the educational success of everyone. It is crystal clear that much remains to be done. In Europe, only one person out of three graduates, aged between twenty-five and thirty-four and the percentage of students who leave school before nineteenth, failing to fulfill the compulsory education and training that Italian school legislation foresees with the attainment of a diploma of Secondary Higher Education, is still high. There are many students who, although enrolling on university courses or post-diploma courses, do not attend and leave, often remaining non-existent and without a life project. The percentage rises, if one looks at the south of Europe and in particular at the regions of Southern Italy. This phenomenon produces unemployment, a critical social situation, so much so as to induce the Italian government to take action, such as the activation of the law on "citizenship income".

### **Analysis, methods and strategies**

The average level of qualifications of undergraduates and graduates does not correspond to that required by the labor market. In general, in secondary schools and among those enrolled in the various university faculties there are students with poor reading skills, poor understanding of texts expressed with the technical language of the disciplines, issues in written and verbal expression, difficulty in communication also through IT tools. In many cases there is a lack of possession of the pre-requisites required to face the complexity of studies and research, both at secondary and university level. A small percentage, follows and exhibits the State exam successfully and graduates with full marks. The academ-

ic world and the school constantly question themselves on how to achieve success and avoid the scholastic and university dispersion that occurs with multiple repetitions and abandonments.

Therefore, for a few decades the University intends to interact with secondary schools in order to share strategies and methods able to overcome the gap and find common solutions in order to permanently remove the obstacles that prevent the achievement of academic and university success. For these reasons, the European program "Erasmus Plus Decoding the Disciplines", allows to learn and activate a methodology through decoding processes of written and oral messages: through a series of steps the student's obstacles hindering the real achievement of the desired formative success for all; this in strict compliance with the democratic principles of all European Constitutional Charts and recommended in all the documents concerning education and in all the sectors that deal with the training of citizens included in a project aimed at achieving full social and civil cohabitation.

The practical implementation of the "Decoding the Disciplines" methodology has included numerous training and research meetings with the introduction, experimentation, application and evaluation of the quality of teaching and learning in higher and university studies. The teacher who decides to adopt the decoding methodology, starts from the knowledge, from the analysis of individual social and cultural prerequisites, or in small groups of students (three or four) and through a careful analysis understands the student's real level of preparation; identifies the blocks that prevent them being able to understand and assimilate more complex content.

From the analysis of the obstacles that are accurately recorded, the teacher has to choose some fundamental contents to be divided into progressive sequences in order to proceed in stages, from the simplest to the more complex, proceeding for repeated feedback to ascertain that the determined segment of knowledge has been indeed learned and assimilated. This

means constantly monitoring student's progresses to ascertain what real difficulties they encounter in acquiring the basic knowledge of a given topic (poor reading skills, insufficient and inappropriate vocabulary, poor comprehension of the text, difficulty in oral expression) and an argumentative type of writing, a lack of exhibition capacity regarding the Italian language). The use of continuous feedback for improvement, aimed at overcoming "bottlenecks" and the construction of disciplinary knowledge, certainly contributes to enriching and developing thought.

Certainly, once the obstacles have been identified, the teacher will try to adapt the teaching according to "Cooperative learning", the collaboration between the student and the teacher, aiming at the construction of a "*forma mentis*" which is constantly updated and modified through the experience and with the study. Establishing an empathic relationship, in a climate of collaboration and trust, is important in order to achieve the pre-established results. The interviews (of short duration) are important, because through them the teacher can adapt the most suitable methodology to the student who must show interest and responsibility for what they learn. The teacher must check that the segment of knowledge taught has been completely assimilated by the learner. In the next phase another obstacle will be faced, then the teacher and the student will move on to another step, until completion of the proposed action program.

Teaching the discipline by progressive acquisitions must lead to the mastery of the whole subject. The knowledge of the prerequisites, objectives, processes, evaluation and feedback, will allow the student to improve continuously so as to arrive at an articulated elaboration of the unitary thinking that will re-emerge, overcoming the initial fragmentation. This will allow everyone to study independently and critically, with the adequate mastery and discernment to reach the desired scholastic and educational success. Hence, there is the need for qualified and constantly updated teachers, who have understood well the methodology, inspired by the principle of public schools open to all.

## The results of the experimentation

This brief introduction was aimed at illustrating in general terms the program I followed in the years 2017 and 2018. This discussion is far from being exhaustive, also for the rich pedagogical literature, for the numerous contributions offered by distinguished specialists as well as for the vastness of the research that is implemented in the field in different countries. At this point, it is worth indicating some processes and the results of the experimentation I conducted following the methodology of "Decoding the Disciplines". In order to know the basic prerequisites, in October 2017, in two primary classes of the Italian high school "Giovanna De Nobili" in Catanzaro, an open-ended questionnaire containing questions on history, geography and citizenship was submitted to 60 enrolled students, coming from middle schools of the city, but also from schools in the province; 30% of students, in fact, commute. The questionnaire was preceded by a series of individual and group interviews aimed at getting to know the personality of the students, their previous school and life experiences, the motivations for choosing the specific area of study.

The students, boys and girls, all fourteen years old, showed inhomogeneity due to their socio-cultural background and were divided into groups of four to five. They showed poor cohesion capacity with evident socialization difficulties, poor openness to dialogue. They would always use their phones, and this is a very tiring teacher's daily business to make students understand that the phone, the tablet, are tools whose use must be subordinated to the needs, but they must not determine a dangerous dependence.

Another issue was that the attention of the students was focused on the image; there was great attention and interest in video-writing, the lesson organized on the interactive multimedia whiteboard, the drawing, the screening of a film, while reading documents in the history manual or other paper-based media was scarce and difficult to apply; the same for traditional written production. Adolescents, in

general, do not show interest in written production in the form of a document, a discussion, a narration, an exposition, a synthesis, research. Given the same starting situation, we proceeded by parallel classes, including the same programming because substantially the composition of the classes had the same characteristics.

At the end of November, from the results of the questionnaire, from the analysis of the available data, from the verifications carried out the following emerged: Lexicon: poor knowledge of the terminology-vocabulary not appropriate; Mnemonic reading - literacy, poor understanding of contents - presence of spelling, grammatical and morphological errors in very limited written exposition, even the oral expression was not very articulated and fragmented; the conception of history understood as an abstract fact and not as a practicing discipline of human sciences; absence of the conception of history as a succession of events that presuppose a cause and an effect; poor knowledge of the principles of citizenship; refusal to compare history with other disciplines; refusal to carry out research, as a study of deepening a historical fact, disinterest in the deepening of the peculiar characteristics of a nation; tendency to describe a topic in two, three lines; lack of a systematic and continuous method of study. Basically, there were only minimum pre-requisites, which were totally inadequate to face a first class of high school.

In order to proceed, and enable the class to achieve the content and training objectives provided for by the national indexes, by Decree of the President of the Republic and therefore prescriptive and mandatory, for the first year of the course, convinced that it was necessary to create an empathetic relationship with the students and to establish a climate of trust and collaboration, I started, for example, to "narrate" the topic of programmed history connecting it to geography, reporting anecdotes and salient details of the biographic profiles of characters linked to the historical period treated. I captured the attention of the students and then passed to reading some documents, linking the topic to the actual daily reality through

geography and current affairs. The students continued the work in interchangeable groups, in which they discussed with each other on what was narrated and read. The students were eventually invited to draw up short written reports on the subject.

Even for reading we proceeded by steps: first short readings, which were accompanied by an oral assessment in order to verify the understanding of the contents and the enrichment of lexicon. This allowed us to begin the construction of an increasingly complex thought process, also highlighted in the written exhibition that step by step became more and more articulated, accompanied also by personal considerations. Very useful were the notebooks, which accurately reported the contents of the topics narrated, read and assimilated.

This method produced the satisfaction of students and parents who had the opportunity to see the continuous improvements of their children who, in the meantime, had finally found the enthusiasm to learn. Also, research was guided, in order to understand the value of the deepening of a specific historical period, the geo-political situation of Italy or of a European country. In the evaluations, traditional type questioning was transformed into an interview on a given topic, conversations repeated several times also on a group of students, in a short time (five to six minutes per student) until the students became aware they had overcome the obstacles hindering personal learning.

At this point, the collective will of parents, students and teachers came into play, wishing to continue their studies, aimed at continuous improvement. All this led to an effective learning of skills in an interdisciplinary way with the achievement of good results for everyone at the end of the school year. Therefore, also the other experiences from the Great Hall of the University of Roma Tre, where I was given the task of coordinating the Group 4, composed of two teachers and two students coming from the fifth class of a secondary school in Rome (an Italian student and a non-EU student of Islamic religion). I assumed the task of introducing the

conversation, while the other colleague, present at the interview, recorded the content in writing. I had to answer the question I had been asked: "How can you help students to define obstacles in the learning of disciplines?". After a short conversation of presentation, during which we defined the roles that each of us assumed in that context, an empathic relationship of mutual trust and collaboration was immediately established with the students. They were invited to clarify what were the obstacles that prevented learning.

The students themselves highlighted the "Bottlenecks", the learning difficulties they encountered in their daily educational dialogue in the class group they belonged to: low ability to relate with the teacher, low application caused by lack of interest in the topics, discontinuous study due to family problems, difficulty in expressing themselves due to the learning of a second language (Italian) for the student of foreign language, difficulty in expressing an independent critical thought, an inadequate method of study to face the complexity of higher education, lack of knowledge of citizenship skills. Students were advised: to assume a greater responsibility for attitudes towards the scholastic commitment and to set up a systematic study of the subjects in view of the preparation for the State Exams, which concluded the higher studies; to resolve the problems with the family and the foreign student was advised to resume the study of Italian grammar and morphology, consult the Italian language vocabulary, read classics in Italian language, newspapers and magazines, written production and exercise of oral expression. A classroom report followed, in which I succinctly described my ex-

perience about the adoption of the "Decoding the Disciplines" methodology.

Then an article was published, which appeared on March 13, 2018 on the "Quotidiano del Sud". It underlined the importance of the dynamic sequence methodology aimed at allowing the various disciplines to be mastered in an interdisciplinary vision as well as training teachers towards a more reflective and organic approach to teaching. The same article highlighted the motivation for the region of Calabria to participate, due to the many interests that these events of a European and global nature can represent in training, socio-cultural and economic terms, given that the program deals with innovation and cooperation.

## Conclusion

In conclusion, I think some of the positive actions contained in this program have been highlighted. A program constantly monitored by several universities joined together by Memoranda of understanding in partnership, whose contents go beyond the academic dissertation and constantly build in daily school and university practice, examples, models of recovery of skills, training paths, remarkable goals towards the reconstruction of a critical thought that favors and determines the integral realization of the human person. An instrument, "the decoding", that the school, the academic world and all the other Institutions and Educational Agencies cannot do without ignoring thinking about the future European citizens, called to carry out their task and to face the challenges of complexity in the third millennium.

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# Grasping the life-significance of the disciplines.

## Some notes about secondary school and university courses

Paola Falcioni

[falcipa@gmail.com](mailto:falcipa@gmail.com)

Università degli Studi Roma Tre, Italy

*This paper reports the results of a focus group which contributed to the Decoding the Disciplines workshop organized by Sandra Chistolini (12 March 2018, University of Roma Tre). This contribution gathers some critical reflections relating to students of secondary school and university courses. Since the students can have learning difficulties, a few questions arise. Which points of their training register lack of comprehension? What could be the reasons? With reference to the study of the geography, how can the teacher prevent mnemonic learning and instead educate toward landscape knowledge and critical thinking?*

**Keywords:** lack of attention, communication strategies, exploring geography

### Introduction

In order to identify the factors that reduce the efficiency of the student's learning process, some experiences relative to three secondary schools in Rome, and the Geography and Didactics of Geography course held in the degree of *Infant and Primary Education Teacher Training*, at the University of Roma Tre, will be considered. This took place in accordance with the Decoding the Disciplines project. First of all, the difficulties concern the communication strategies adopted by the teacher, and it is not to forget that the same difficulties occur also in the teaching of geography. But other problems arise being connected to the theoretical and methodological nature of this discipline. Indeed, how can the teacher stimulate the student's attention to carefully observe and "interview" the environment? How can the student face the landscape analysis? How can the teacher prevent a student's mere descriptive and compartmentalized knowledge? How can he stimulate the students to understand the geographical processes?

### The secondary school experience

This paper is concerned with the technical and scientific disciplines. The discussion and critical reflections highlighted the fact that the obstacles that the students encounter in their comprehension and learning training arise at different stages of the teaching process, which begins from drawing the student's attention to a new subject and attempting to establish a direct and intense communication channel with them.

With reference to student attention, sometimes the teacher introduces the subject providing vague, cryptic, and even disorienting information. Other times they present an excessive amount of information which can be difficult to assimilate. Consequently, the students' comprehension and learning process is interrupted. But at this initial stage they do not always have the presence of mind to ask for clarifications which would assist them in establishing a mental picture of the subject.

Sometimes the teacher neglects to introduce the new subject through a brainstorming step aimed at preparing the student for the new topic, and forming an organic structure in the learning process. These remarks make us reflect on the fact that every new piece of information needs to be connected with a pre-figured mental structure. Moreover, the new subjects can be introduced by the teacher in a bland, flat manner that lowers the emotional involvement and mental focus of the students.

When disciplines or certain topics are found to be difficult, how can the teacher adopt stimulating strategies to introduce them to the students? In the face of complex or abstract topics (science, mathematics, philosophy, for example), the teacher overlooks using the life and the concrete humanness of the scientists and thinkers who produced those theories. By doing so, the teacher could stimulate the student's emotional involvement in learning. Concerning this point language and communication strategies are important. Sometimes the teacher assumes that the meaning of certain words is well known by the student and does not redress the lack of understanding of the words. Other time the teacher communicates topics in a rapid manner, hindering the mental assimilation of the contents. Often new explanations assume clear knowledge of previous ones that the student has not yet acquired.

Laboratory activity may be a useful resource, but these activities are often reserved, at best, to those specific disciplines that are targeting future professionalization, for example language or science, excluding other opportunities, as can be seen below.

Now the question is: which strategy does the teacher adopt to correct students' errors or to help them in case they get stuck? The trouble is that the teacher often reiterates the correct concept, but in an assertive way, without helping the student to become aware of the specific point of their weakness and of the related causes. The group discussion relative to the secondary schools underlines how often the students feel the training is unfamiliar to them,

far from their life and their interests. Hence, they reveal a mnemonic teaching practice, unable to promote a critical spirit and encourage the exploration of the problematic nature and the dynamism of the cultural heritage of the disciplines. Often the teacher appears unable to make the disciplines feel updated and topical. This is valid also for humanistic disciplines, such as philosophy or history. It is difficult to highlight how their role and potential can help us understand our modernity. Exceptions are those disciplines which are considered to encourage work placements, such as languages and technical studies.

### **Geography or education for the territory?**

The above analysis can be complemented by the experience gained teaching Geography and Didactics of Geography in the 2007-2018 academic year. Some of the bottlenecks are hereby confirmed, while others are directly related to the theoretical and methodological nature of the discipline. Hence comes the opportunity to foster a critical reflection about this point. But there are also other reasons of interest. First of all, the observations refer to a sample of analysis different from the previous one, since they relate to a university level in which the students come across the discipline in their fourth year. Furthermore, bottlenecks multiply when the student meets a discipline which interconnects the system of nature to sociocultural, economic and politic ones.

This is the reason why geographical education consists of many, complex objectives. Specifically, the discipline teaches the various issues related to Earth science, human geography, and also cartography and the didactics of geography. They are topics which are both scientific and human that often cause difficulties for the students at different points of their training. Often, they show resistance to carefully observe and 'interview' the environment, both their own space of life and the far horizons. To use a paradox, it appears as though the students approach geographical phenomena only through

the textbook instead of through the landscape. It is a deficit which measures their level of alienation with regard to the environment. This is also the reason why the subjects are always presented both in oral and visual modalities, through photos, maps, video or even famous paintings.

We can only guess the reasons for this resistance. One hypothesis may be related to the kind of teaching the students have been previously exposed to. Usually it was a kind of descriptive knowledge, limited to memorizing the 'where' and 'how' of the geographical phenomena, instead of exploring their scientific dimension. Indeed, the contemporary epistemic statute of geography is based on the explanation and comprehension of the territorial processes. Past experiences have shown that the student's lack of attention and curiosity reveals itself in the early stage of the learning process, i.e. when students should be venturing out on geographical reality using their five physical senses. It depends on these last whether the geographical reality, that exists ontologically around us with its elements and dynamics, is transformed into *landscape*. But it is hard for the student to experience how these different sensorial forms - landscape, soundscape, smellscape, tastescape, skinscape - mark the first step in the geography learning process. After all, this strategy matches the individual perception, visual and kinesthetic skills, for example. Furthermore, we also remember that children's geographies indicate the opportunity to start from vicinities and then to push back boundaries in concentric and trans-scalar horizons. This is to reaffirm the sensory experience as the basic way to enter a geographical analysis.

All these reflections have suggested to stimulate and assist the students first of all with a personally experiential kind of learning approach, exploring their personal geographies, looking at their biographical space of life. Then, starting from this foundation, the teacher can move forward and explain step by step, how both nature and human processes have developed. Following this line, the lesson is strengthened by the systematic use of visual images and field trips.

This is only a first step, since this brings us to consider the whole framework of emotions, feelings, and those meanings and values people give to their places. As we see, the landscape analysis leads us to use the tools offered by perception and humanistic geography. This semiological-semantic level of analysis does not end the practice of surveying the territory. This can be further investigated under a different, third perspective; that is to look at its spatial structure, its organization and operational functions. In short, we mean, the capacity of our Planet to 'work' as a system, a dynamic global structure. Systemic analyses may be the last step of the student's journey to enter the world of geography; it is a journey that starts from the local horizon and the personal geography and finally stretches out to explore and assimilate the framework of the world.

It appears that the three investigation strategies here mentioned - i.e. the landscape, the semiological-semantic and the systemic analysis - all grounded in the actual statute of the discipline, counter a merely mnemonic geography. The epistemological statute of the discipline also defines its educational objectives. Proposing the geographical topics through problems, causes and processes may become an opportunity to stimulate a more acute interest. Of course, this strategy requires the avoidance of a compartmentalized study. However, such an educational approach reveals a new weakness, as the comprehension of the geographical processes needs to get back to their roots, the causes, even if they reside in the area of other sciences. For example: how can one understand the dynamics of the atmospheric circuits without referring to the kinetic theory of gases? How can one understand the morphology, structure and the volcanic activities without introducing the chemistry of magma and the melting points of silica and iron rocks? This requirement can complicate the explanation, but the interdisciplinary framework can become a point of strength for the student, since geography clearly appears interrelated with other disciplines.

With reference to language and communication strategies, the teacher is aware they are

addressing students who in turn will address children in primary and pre-primary levels. So, they are recommended to also adopt a simple language, one that is connected to their daily life. This means a language which is different from the academic or scientific lexicon used in university textbooks. This practice makes the comprehension of the territorial system easier but, on the other side, the use of a high/low language complicates the student's study. In this predicament they are induced to simply memorize definitions and concepts; by doing so they go back to that mnemonic study that the teacher intended to prevent.

The laboratory is an integral part of the course of geography. The proposed activities consist – *inter alia* – in reading and interpreting topographic maps and the relative scenes on Google Earth, cross-referencing in this way

the different languages. In this regard students show some difficulty in finding the main functional connections among the various elements of the territory represented on the maps.

The above considerations, by showing some learning difficulties, highlight the main purpose of the course of geography as being formative more than merely information-based; indeed it aims, in accordance with the Decoding the Disciplines method, at stimulating an inquisitive *forma mentis* in the students, making them curious and open to “interrogating” the territory: a window open to environment dynamics, interacting more or less harmonically with us. To conclude, the course of geography presents itself as education about territory *through* the landscape, as a prerequisite to its safeguard and to responsible citizenship.

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# Enhancing critical evaluation and appraisal skills

Mary Greene

[mary.greene@nuigalway.ie](mailto:mary.greene@nuigalway.ie)

National University of Ireland, Galway, Ireland

*Critical evaluation and appraisal of scholarship is a key component of critical thinking skills in higher education. In this paper, the DD methodology is applied to elicit bottlenecks in postgraduate students' mastery of critical evaluation and appraisal skills. Initial consultation with students and teacher reflections identified internal and external critique as two bottlenecks in student's critical engagement with scholarship. A redesign of the module structure around a flipped class-room approach structured around a critical reading framework sought to encourage the development of key mental operations necessary for proficiency in developing internal and external critique skills and developing a critical lens to literature evaluation. End of term surveys revealed that students found the methods effective for enabling them to develop and enhance their critical thinking skills.*

**Keywords:** critical thinking, literature evaluation, critical appraisal, flipped classroom, reading framework

## Introduction

The importance of critical thinking skills to geographical thinking and study is a crucial prerequisite for developing a critical geographical lens. A key component of critical thinking in academic spheres is the ability to critically evaluate and appraise academic scholarship and literature (Behar-Horenstein and Niu, 2011). Specifically, students must not only be able to critically analyse a piece of work in terms of its structure and argument, theoretical and methodological merit, but they should also be able to evaluate any one piece of scholarship in the context of wider debates and paradigms of thinking. This level and skill of critique are especially important at postgraduate levels (both taught and research programs); at a postgraduate level students are increasingly required to develop and hone their critical evaluation skills in order to meaningfully master an area of in-

quiry, learn disciplinary ways of thinking (Middendorf and Pace, 2004) and contribute to the production of new knowledge (Melles, 2009).

## Theoretical background

The DD methodology was employed with a group of 10 postgraduate students undertaking a master's level module on critical social science approaches to environment, risk and resilience at NUI Galway. These students came from a range of natural and social science backgrounds. As such, a rather diverse level of prior engagement with and expertise in sociological, geographical and ecological disciplinary knowledge was present among the group.

From the lecturer's previous experience teaching on human geographical and critical social science postgraduate modules, students'

difficulty in effectively mastering critical evaluation and appraisal of scholarship had been noted as a key issue. This is a troublesome area of knowledge that emerged across students with diverse backgrounds. A key area of difficulty noted was in relation to students' ability to evaluate complex theoretical literature. To investigate this area of troublesome knowledge further from the students' experience and perspective, the DD methodology was employed with this group of 10 postgraduate students to uncover specific bottlenecks that foreclose students' mastery of critical evaluation and appraisal of scholarship. Particular attention was given to uncovering key dimensions of literature evaluation and identifying mental operations and actions that facilitate the development of more effective critical appraisal and evaluation skills in these dimensions.

### Identifying bottlenecks in learning

Upon explaining the DD methodology to students, they participated in a bottleneck identification survey and focus group discussion. Initial student surveys and focus groups confirmed that students have difficulty critically evaluating and appraising complex theoretical literature underpinning the module. Following more in-depth exploration through focus group discussions, two specific sub-bottlenecks relating to critically evaluating scholarship emerged. Specifically, it was found that students expressed difficulty in critically evaluating literature in two key dimensions, relating to 1. critically appraising the internal validity and strength of a piece of scholarship, and 2. critically appraising a piece of work in the context of its relation/contribution to wider debates in the field. These two dimensions were respectively labelled 1. Internal critique and 2. External critique, and defined as follows:

1. Internal critique refers to an ability to critically evaluate a piece of scholarship in its own terms, in terms of strength of argument, theoretical clarity and methodological coherence;
2. External critique involves evaluating the strength and contribution of the argument

in terms of situating it in relation to external debates and arguments.

### Mental operations underpinning bottlenecks in learning

The next step of the DD process was to uncover the mental operations and processes associated with the mastery of the two bottlenecks identified, that is, internal and external critique. The focus group discussion with students identified the following mental operation as central to students' mastery of critical evaluation and appraisal of the scholarship in the two identified dimensions, as follows:

- Students should be able to evaluate a piece of scholarship in terms of its internal organisation. In this respect, students should be able to critically interrogate the quality of a piece of literature, and the overall coherence and consistency of the work, in terms of the argument's key thesis, theoretical argument, methodological structure and findings. These mental operations relate to internal critique.
- In addition, students should be able to critically evaluate a piece of scholarship by situating it within the context of broader arguments, debates and frameworks. In this sense, students should be able to draw on prior learning to situate their reading with the broader scholarship landscape. These mental operations relate to external critique and requires skills of lateral thinking and engagement.

### Process and practice

The DD methodology, in advancing a student-centred approach to pedagogy, challenges the notion of the lecturer as sage on the stage to instead adopt more of a facilitating or hosting role as that of guide on the side (see Mc William, 2009). The DD methodology was employed to redesign the module to facilitate students in mastering the two bottlenecks relating to critical evaluation that is internal and external critique. This process involved a redesign

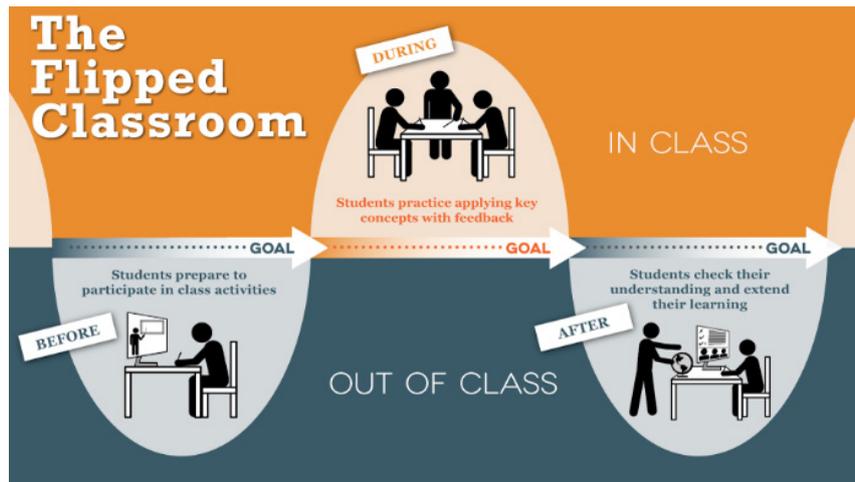


Fig. 1. Structure of the flipped classroom framework

of the module around a student-centred learning format approach incorporating student and problem-centred pedagogic activities. This student-centred format centred on a flipped class room (FCR) structure, organised around student-led seminars whereby students are actively leading the class discussion. The format is structured around a combined precis and critical reading framework, whereby learning takes place through several steps, both during class time and outside of class time, outlined below.

The flipped classroom structure was organised around student-led seminars in which two students were responsible each week for leading the seminar discussion. This involved them using the critical reading framework (outlined below) to engage in internal and external critique of the literature during a series of activities centred on stimulating pre, during and after the class reflection and discussion. A series of pre, during and post class activities sought to embed an element of peer-to-peer learning into the pedagogical structure.

The module was organised thematically over a period of 12 weeks. Each week explored a different dimension of environment, risk and resilience. Furthermore, each week students were assigned two key required readings and two additional recommended readings each week that engaged with the course themes. These readings formed the foundation for the student-led flipped classroom activities (outline in Fig. 1).

The flipped classroom structure was formulated in three key steps, involving pre, during and post class activities, as follows:

## Prior to class

### 1. Prior to class

#### *Critical engagement of readings, précis preparation and pre-submission*

Prior to class, students are required to critically engage with the assigned readings using the critical reading framework (outlined below) and pre-submit a 300-word minimum (400-word maximum) précis to the lecturer in advance of the class. Précis writing was incorporated to support critical reading. In requiring students to document their evaluation of the literature in writing, this précis learning activity was incorporated to ensure students had engaged with the material sufficiently to enable them to make the most of the in-class discussion.

#### *Critical reading framework*

In addition to restructuring the class format, a new reading framework was formulated by the lecturer in order to facilitate and guide students' mastery of internal and external critique and support the development of critical evaluations skills in their engagement with course material.



Fig. 2. Example of student-led seminars



Fig. 3. Students engaged in peer-to-peer discussion

This reading framework provides guidelines for facilitating mental operations necessary for internal and external critique. The reading framework was provided to students to structure the students' analytical reading of academic texts in preparation for student-led seminar presentations. Students were also encouraged to use this reading framework to structure in class discussion. The reading/presentation outlined a framework guiding students' précis writing entailing:

1. A statement and extended explanation of the authors' main argument(s) and analytical concepts
2. A critical response to the readings in terms of internal (strength and weaknesses of the argument as presented by author/s) and external (how the main argument and analytical approach of the authors relates to other theories and frameworks as well as to the content of the MA programme)
3. Development of key discussion questions to further develop own and the groups thinking

## 2. During class

The reading framework ensured that students' learning remained focused on mastery of the mental operations underpinning internal and external critique. The in-class student-led activities maintained this structure through stu-

dent-led presentations evaluating the literature (Fig. 2) and peer discussion in which students shared their précis evaluations (Fig.3). The students leading the seminar presented their critical evaluation of the readings in a PowerPoint presentation, following which students engaged in a class discussion on their critical evaluation of the readings. Ample opportunities, facilitated by pair work and discussion based activities, provided a context through which peer-to-peer learning in critical evaluation and appraisal could occur.

## 3. After class

Following the class discussion, students were required to update their original précis submission to include additional insights they had garnered peer-to-peer learning that occurred during the class discussion. Students were required to update their précis with a 300-word reflection on how their understanding of the concepts has changed or progressed in the context of the class discussion. Here students were again required to pay particular attention to the internal and external critique of the readings. Students were strongly advised to complete this reflective activity immediately after class on while their experiences are fresh in their mind.

Over the module students added this pre and post class précis work to a student portfolio which formed part of the module assessment. Each student was required to add their weekly

pre and post précis submission to their students' portfolio over the course of the module which enabled them to track their learning over the course of the module.

### **Practice, feedback and modelling. Modelling**

The importance of providing opportunities for students to practice the mental operations and receive feedback is a crucial component of the DD approach. Furthermore, it is essential that lecturers model the type of thinking required to effectively master the bottlenecks identified.

Providing ongoing and early feedback to students is central to the DD methodology approach. This is important to keep effective track of students' mastery of the mental operations as well as garner the effectiveness of the pedagogic tools and activities in facilitating their learning. Following this, feedback to students was provided early and continuously throughout the course of the module, in the context of the pre, during and post-class activities. Key feedback media included: 1. Personalised feedback on portfolio submissions 2. Graded feedback on student-led presentations, and 3. In-class modelling and feedback

#### ***Ongoing, personalised feedback on portfolio submissions***

With regard to the pre and post class portfolio submissions, the lecturer provided personalised feedback to the students at three points over the module (week 3, week 6 and week 9). For this purpose, the lecturer devised a feedback rubric structured around the reading framework. This rubric was used to grade students' weekly submission and provide ongoing feedback on their evolving mastery of internal and external critical reading skills. As outlined, each student's weekly submissions formed part of a larger portfolio on the development of their learning over the course of the module. At the end of the module, the students were required

to collate their weekly submissions together with a 1000-word reflective essay that provided an overview of the key components of their learning over the module. This portfolio comprised 40% of their overall course grade. In this way, students were able to respond to and build on feedback throughout the module to progress towards their final submission.

#### ***Graded feedback on student presentations***

Each student was responsible for presenting and leading the class discussion twice during the course of the module. For each of these sessions, the lecturer provided in depth feedback to the student on their running of the class, paying particularly attention to their presentation skills and their focus on eliciting students internal and external evaluation skills. This accounted for 20% of each student's final grade for the module.

#### ***In-class modelling and feedback***

Throughout the student-led seminars, the lecturer's role was to moderate the student discussion. This moderating role involved the lecturer demonstrating, modelling and enacting critical evaluative and appraisal skills in her interpretation and summary of class discussion. In providing ongoing feedback in this way, the lecturer focused on continuously encouraging students to consider how the conceptual material can be explored from the perspective of internal and external critique. To facilitate this, the lecturer drew on a range of prompts to guide discussion back to a consideration of the key elements of internal and external critique, especially during times when discussion verged off these dimensions. This resulted in the lecturer modelling ongoing feedback to students over the course of the module.

### **Reflections**

Students feedback on their participation in the module was very positive. Students feed-

back revealed the effectiveness of the pedagogic activities in enhancing the development of their critical reading and evaluation skills. Students found the flipped classroom structure very effective means of motivating them to engage critically with the material

### **Sharing conclusions**

The initial identification of the bottleneck area was arrived at in terms of the lecturer's own personal reflections on her pedagogic practice and students' learning experience. Initial difficulties observed in relation to students' mastery of critical evaluation of the literature were further discussed with colleagues teaching on the master's programme at an internal review meeting. During this meet-

ing, the lecturer discussed the DD methodology and her intention to employ this with the class to deconstruct and address this area of troublesome knowledge. The DD process and outcomes were documented throughout and have been shared and dissemination with colleagues through a number of informal and more formal avenues, including internal teaching review meetings as well as during presentations at three international meetings and conferences (EU GEO, NUI Galway, 15<sup>th</sup>-18<sup>th</sup> May 2019; Decoding the Disciplines international meeting, 3<sup>rd</sup> Dec 2018; RGS Annual International Conference, 28<sup>th</sup> -30<sup>th</sup> Sept 2019). Furthermore, a blog post was written for the lecturer's website [marygreene.blog](http://marygreene.blog). Furthermore, a peer-reviewed journal paper is currently being prepared for the journal *Teaching and Learning in Higher Education*.

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# Decoding in the English language classroom

**Diana Agnese Pallotta**

[dianaagnese.pallotta@uniroma3.it](mailto:dianaagnese.pallotta@uniroma3.it)

Università degli Studi Roma Tre, Italy

*Decoding methodology was applied during the first semester of English language teaching to final year undergraduates reading Languages and Modern Culture, specifically with regard to the module component of Reading and Use of English. The end of year exam results of the previous cohort were used as a standard to measure the effectiveness of Decoding. The findings of this study show that students who received even a small amount of Decoding improved their performance. Furthermore, student achievements were higher while their failures were capped and not as extreme as those of their predecessors who did not receive Decoding.*

**Keywords:** Decoding, language teaching, improved performance, capping failures, inclusion

## Introduction

In our globalised world, plurilingualism is not only a necessary competence for entering an international job market but also acts as a vehicle through which cultural identities and diversities can be both affirmed and shared (Council of Europe, 2007). It promotes European common values such as social cohesion and human dignity (European Union, 2007) and inclusive education. The university classroom is a privileged place where these values can be nurtured through teaching and learning activities, through the dialogue which is established between teacher and students. However, when that communication goes awry, when students do not perform as expected, the door to prejudice and exclusion is left open, giving way to inequalities which Education would rather seek to counter. In such a scenario, Decoding the Disciplines is a methodology which can redress the balance so that all individuals can fulfil their potentials and ultimately play an active part as citizens.

## Theoretical Background

David Pace (2013) highlights how the expert teacher may overlook some of the key steps required for completing disciplinary tasks – steps that are crucial for the apprentice student to learn. In fact, teachers are so used to dealing with complex cognitive processes that they unintentionally neglect to model the simpler ones, those which are essential for mastering learning. Furthermore, students are not given enough opportunities to practice and receive feedback. In addition to reinforcing the distance between expert and apprentice, both parties are left dissatisfied with their experience of the educational process. In fact, the outcome of this failure in teaching and learning is that only a limited number of students will, eventually, achieve. Moreover, this also automatically, if not systemically, excludes a significant portion of the student population from acquiring the required and desired knowledge. The inevitable repercussions include an increase in the risk of student drop-out rates and lower job prospects. (Chistolini, 2004). It is precisely here that the Decoding the Disciplines methodology (DDm)

can play a crucial role in redressing inequalities and promoting democratic values.

### Decoding in Context

The DDm sample was selected from undergraduate students in their final year of the 3-year degree in Languages and Modern Cultures. The course chosen was English Language and Translation, which is divided into three modules: 1) Translation; 2) Listening; 3) Reading and Use of English. The latter two modules are known as the *lettorato inglese* modules. That is, a language lab with a mother-tongue lecturer which runs for 20 weeks over two semesters. Each lesson lasts 2 hours and is repeated twice a week so as to widen participation. There is not a minimum requirement for attendance, in fact it is not compulsory to attend lessons and students from other departments as well as members of the public can participate in classroom activities. Decoding was used in the Reading and Use of English module which despite its name, also gives ample space to developing speaking and writing skills. In fact, English is the main language used during lessons and most classroom activities revolve around groupwork. This is considered a novelty for students as they are not used to working in groups in their other classes.

### Decoding Bottleneck

The exam for Reading and Use of English is the one which most students have difficulty passing at the first attempt, in particular the Use of English component. Some of the language competencies assessed include knowledge of grammatical structures, collocations and vocabulary. According to the raw scores from the previous May 2018 exam session, 81.72% of students passed and 18.28% failed. These results were used as a reference against which to evaluate the impact of DDm after one semester of teaching.

Three tools were used in the application of the methodology and the evaluation of its effectiveness: 1) the KW questionnaire with an

additional question on obstacles to learning; 2) an outside classroom learning activity; 3) a past exam paper on Use of English as mid-course assessment.

The KW questionnaire was given to 53 students, 21 of which submitted their responses. From these, a clear bottleneck which appeared was related to emotions, and confidence in particular: *"I'm able to understand and participate but I have some "problems" with difficult grammatical skills and written English because of frequent doubts"*. This was then confirmed by 11 responses which again dealt with emotions: *doubts, scared, prior (negative) learning experience, confusion, shame, doubts, feeling overwhelmed, making mistakes* (all students' words). Furthermore, during 1:1 tutorials (*ricevimento*), students confirmed their fear of exams: *"I freeze", "everything goes black", "I have anxiety", "total panic"*.

This student feedback helped identify a narrative bottleneck whereby students saw this particular module as separate from the whole course and were therefore resistant to transferring skills, knowledge and competencies across modules, i.e. recognising grammatical structures. By voicing the thought processes required to complete tasks, highlighting where and why mistakes were being made, the cognitive processes required for the specific tasks became clearer and easier for the students – rather than focusing on knowing an answer, or “making it up” when they did not, students modelled practical strategies for dealing with low-stakes language-based tasks. That is, they were asked to break down a sentence and identify the grammatical components so that they could both logically and methodically arrive at the correct answer. Hence a lot more space was given to modelling, practice and feedback in comparison to the previous year of teaching and though at times, from the teacher's point of view, time appeared to be being “lost”, it was actually time being very well spent as will later be shown.

Given that one of the main bottlenecks was linked to emotions, as an outside classroom learning activity (Pace, 2013) students were

asked to shoot a 4-minute film during the Halloween lesson.<sup>1</sup> Students were put into groups and given a film title. They then had 90 minutes to write a script and then shoot the film outside the classroom with their mobile phones. Make up and basic props were made available. Some students came prepared with professional cameras and elaborate costumes. Others created their own with whatever items they had on hand: paper and pens, a packet of pecan nuts, a scarf. When the students returned, they were all buzzing and laughing, and though shy and embarrassed at the thought of their film being screened in front of everyone in the last part of the lesson, they were also proud of the work they had done and the response they got from their peers. The students who participated in this activity were also the ones who later had the higher marks in the mid-course assessment.

## Reflections on Decoding

To evaluate the effectiveness of DDm, it is necessary to briefly comment upon attendance. In the first semester a total of 53 students came to *at least* one lesson. At the end of the ten weeks of teaching, 69.81% had attended 5 lessons or less, while 30.19% had attended a minimum of 6 lessons.

A total of 25 students did a mid-course assessment which took place on the first day of the second semester. 52% of these attended 5 lessons or less, while 48% attended a minimum of 6 lessons. However, when student attendance was broken down into the two individual groups the data reads very differently. 86.67% of students from the first group attended 5 lessons or less, one of which had been away on Erasmus. Only 13.33% (representing 2 students) attended 8 lessons, and one of these alternat-

ed between the two groups. The results for the second group are very different. 20% of students attended at least 7 lessons, and 50% attended 8 lessons. Only one student (10%) attended 10 lessons. These figures are interesting when compared with the results of the mid-course assessment and the exam results from the previous academic year. There is no data with regard to attendance for this cohort of students.

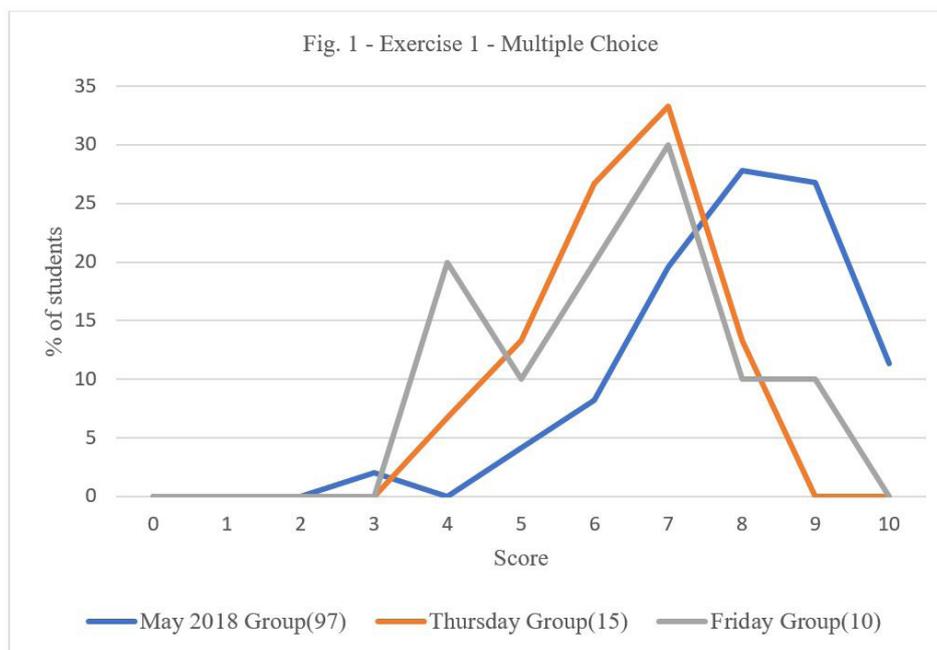
In the May 2018 exam session 93 students sat the exam. 81.72% of students passed and 18.28% failed. Among these there were students who had never attended lessons by choice, others because they were enrolled as distant learners or away on Erasmus. There were also re-sits (some on their second) in this group. The number of these variables is not available. When interpreting the data later on, it is important to highlight a total of 20 lessons (40 hours) had been delivered by the time of the May exam session.

On the other hand, at the time of the mid-course assessment, 10 lessons (20 hours) had been delivered with DDm. The Decoding students were given the same paper for Use of English as those from the May session. 45 minutes were allocated to complete the task (15 minutes per exercise). There were three Cambridge Exam type exercises: 1) Multiple Choice; 2) Cloze; 3) Word Formation. The graphs below compare student scores for each exercise.

The Multiple Choice exercise is composed of a short text with ten blanks to be completed, each worth 1 point. Four options are given. The pass grade for the Multiple Choice exercise was a 6 out of 10. The May group had the highest success rate, with 93.82% passes and only 6.18% fails. The Thursday and Friday groups obtained similar scores: the first had 73.3% passes and 26.7% fails while the latter had 70% passes and

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1 The idea was taken and adapted from Horror Street Movies created by Luigi Coccia and Patrizia Impicini for the recreational association "Il Covo" of Ascoli Piceno. The authors kindly gave their permission to use and adapt the Horror Street Movies concept strictly for English teaching and learning purposes only. If you would like to contact the authors to know more about their ideas for educational games and other role play activities, here are their details: [luigi.coccia@gmail.com](mailto:luigi.coccia@gmail.com), [www.luigicoccia.net](http://www.luigicoccia.net), [patrizia.impicini@libero.it](mailto:patrizia.impicini@libero.it).



30% fails. In the range of passes, the May and Friday groups obtained the highest number of points: the full points available, 10 out of 10, in the first case and just one point away, 9 out of 10 in the second. In the range of fails, the lowest score, 3 out of 10, was obtained in the May and Thursday groups. The lowest score for the Friday group was 4 out of 10.

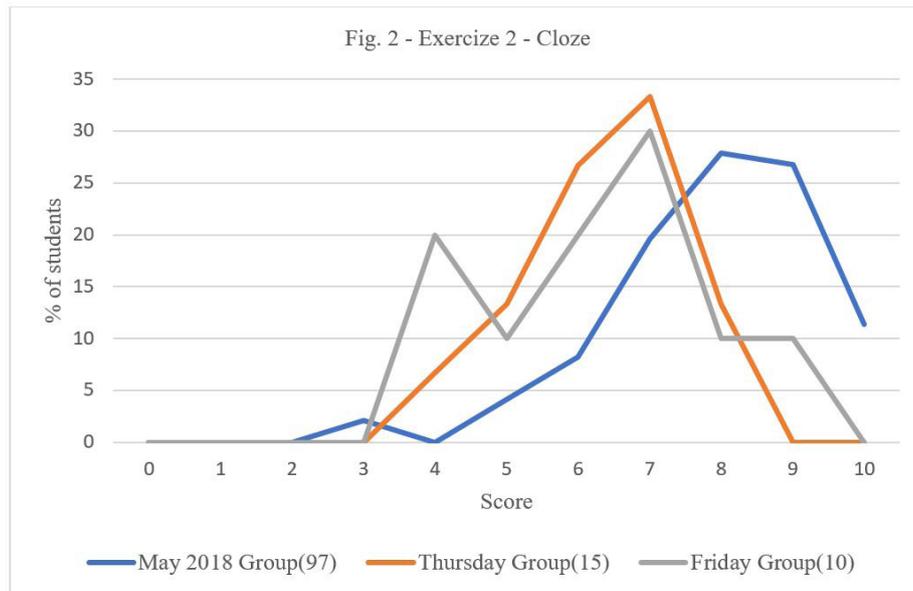
In light of DDm, it could be suggested that student failures are not as extreme, and that passes are slowly creeping toward the higher marks. Furthermore, it is possible that the full potential of student learning and success is capped without DDm and that those showing a poorer performance get left behind at a higher rate. Even though students from the May session got higher marks, it must be remembered that not only they received 100% more contact teaching hours, some of them had already sat the exam in the past. Also, it is interesting to note that the results from the Thursday group are much lower than those from the Friday group, which could possibly be linked to having attended half of the course in the first semester, and therefore half of the DDm.

The Cloze exercise is composed of a short text with fifteen blanks to be completed, each worth 1 point. No options are given. The pass grade for the Cloze exercise is set at 9 correct answers out

of 15. The pass rate for the May group was 40.21%, 6.67% for the Thursday group and 80% for the Friday group. In contrast, the fails were 59.79%, 93.33% and 30% respectively. The lowest score for the DDm groups was 6, while 23.71% of students in the May group got a score lower than a 6. 70% of students from the Friday group scored above the pass mark compared to 40.21% from the May group and only 6.67% from the Thursday group. The highest scores were obtained in the May and Friday groups

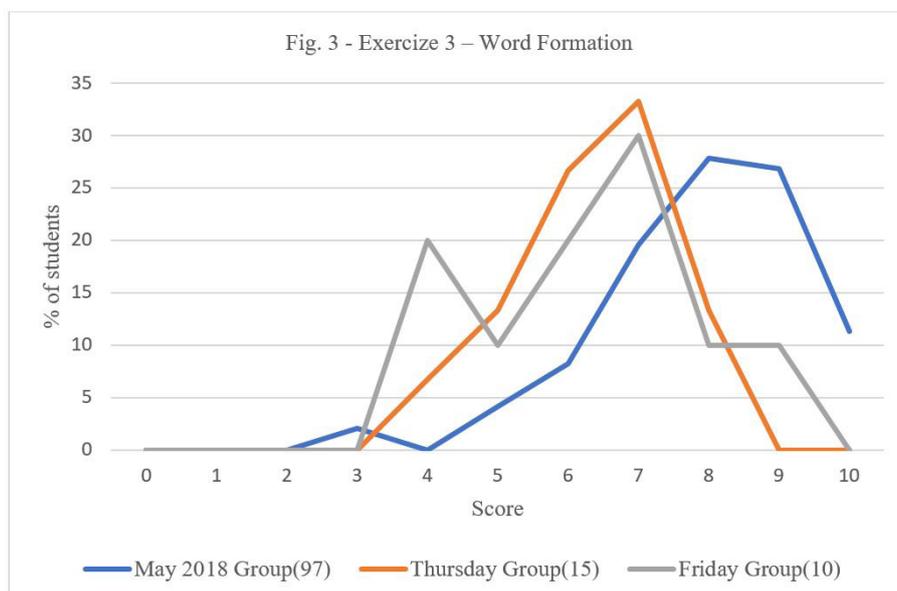
At the beginning of the course, students highlighted that the Cloze exercises were their weakest area, hence a lot of space was given to practice and feedback. The findings suggest that DDm was successful given the very high achievement of the Friday group. Though 93.33% of students from the Thursday group failed, it is encouraging to know that actually 53.33% of students were only one point away from the pass mark, more so because they still have a semester of teaching and learning to go. In the same respect, the Friday group matched the highest score of the May group, with 50% achieving 1 point more than the pass mark.

The Word Formation exercise is composed of a short text with ten blanks to be completed, each worth 1.5 points. A root word is given and



the students have to add affixes to transform the word which can be inserted logically into the text. The pass grade for the Word Formation exercise was 9 out of 15. 57.72% of students from the May session passed. In contrast, DDm student scores were similar to each other, with only 26.67% from the Thursday group and 30% from the Friday group passing. The interesting data here is that for the wrong answers given in May 2018, students came up with ten variations (most of which were non-existent in the English language). On the other hand, DDm students, despite their low scores, not only identified the correct part of speech, but also had a maximum of two variations where

the meanings were very close. Although they made the incorrect choice, this possibly links back to the emotional bottlenecks mentioned earlier, which are triggered as soon as students start moving outside of their comfort zone with higher-stakes tasks. Another issue was misspelled words which could be related to the number of different languages they study on a given day and the time required to become acclimatised from one lesson to the next. DDm has therefore highlighted another area or bottleneck to work on in the run up to exams as well as the need for more time allocated to modelling and opportunities given to practice this particular task and knowledge.



## Conclusion

At the time of writing, the reflection on the use of DDm based on this study's findings is only partial as final exam results are not yet available. Nevertheless, it is very encouraging. The research shows that even when students receive a minimum amount of DDm their performance improves. This does not mean that they do not fail, but when they do, their raw scores are still higher than students who did not experience DDm. It also suggests that students need more time allocated for practice and feedback. Moreover, students who attended

at least 70% of DDm lessons over one semester, achieved the same scores as those who attended 100% more contact teaching hours over two semesters. In conclusion, the current data from this study shows that Decoding the Disciplines is a methodology that limits the number of fails and therefore increases student leaning and achievement, but also shortens the gap or distance between novice and expert. Therefore, it promotes inclusive teaching and learning, breaking down the barriers of inequality and exclusion in the classroom. As the students from the School of Barbiana (1967) said, "Do not fail the students". In other words, allow them to learn and achieve.

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# When do you realize you're not learning something? Decoding and Philosophy of Education

Giovanni Cogliandro

[giovanni.cogliandro@istruzione.it](mailto:giovanni.cogliandro@istruzione.it)

Ministry of Education University and Research, Italy

*The educational path of Decoding the Disciplines (DD) includes the transformation of the class into a teaching research community within which students and teachers listen respectfully to each other, integrate one another's ideas, ask others to provide reasons to support their opinions, help each other to draw conclusions from what has been said. In the experience of DD in Rome last year students and teachers immediately started a fruitful dialogue, interacting without fear, exploring their experiences on the subject with ample and detailed narrative. During the written response phase following the conversation, students produced three texts in which they explained their difficulties with individual subjects. A student included in her text a drawing (enclosed in this article) in which she effectively represents herself while trying to demolish the wall she feels has risen between her and History, the discipline with which she has the most problems. History appears to her as a sequence of interesting and dynamic events, *res gestae*, which she however failed to understand.*

**Keywords:** teaching research community, dialogue, disciplinary difficulties

## Introduction

*Decoding the Disciplines* (DD) could be philosophically evaluated as a didactic practice aimed at the development of critical thinking, understood as an interactive activation of the disciplinary contents together with the acts of thinking and understanding. These are characterized by a positive evaluation of the cognitive potential of emotions. DD is therefore configured as a dialogic practice developed from the particular context in which the learning process is understood as interaction between teacher and learner and not as a transmission of notions or visions of the world, in a Socratic context in which the sessions are held as meetings and are not intended as lessons. These practice sessions are coordinated by one or more teachers who transform themselves into the student's travel companions in discovering the specific problems of the various study

disciplines. When teachers work well and are adequately trained, the class turns itself into a research community and people begin to dialogue together and start to ask questions. The practice of asking questions characterizes and launches the entire research experience in the community, in this educational project that develops in a particular organized context, called *setting*.

Socratic *maieutic* method several centuries ago already considered adolescents and adults as protagonists, talking about problems in a context in which some fundamental questions about the decline of the didactic problems, which always originate from a concrete experience. Sometimes intersecting autobiographical experiences involving emotions and passions are gradually introduced in the dialogue trying to go beyond the mere rational contents of the learning process.

Some philosophers driven by the desire to re-discover learning as a community practice have rediscovered the ethics of the virtue of Plato, Aristotle and Aquinas, seen as a philosophical framework capable of developing a close union between practices and learning, participating in the rebirth of practical philosophy. Martha Nussbaum is among the best known, but before her very different authors such as Elizabeth Anscombe, Philippa Foot, and Rosalind Hursthouse have developed the bases for the idea of the learning and research community. The idea of a research community can be connected with the emergence of communitarianism in an Anglo-American philosophy during the 1980s, driven by thinkers such as Alasdair MacIntyre, Michael Sandel, Charles Taylor. They effectively renewed moral and political philosophy which was until then too narrowly focused on the two competing paradigms of normativism and consequentialism, looking for a third ancient way and new at the same time.

The educational path of DD includes the transformation of the class into a teaching research community within which teachers and young people listen respectfully to others, integrate the ideas of others, ask others to provide reasons to support their opinions, help each other to draw conclusions from what has been said.

## Theoretical background

The main question posed by teaching today is how to really educate the difficult activity of thought, as educating to be competent in certain areas of action requires the consequentiality of reasonableness, and this cannot be fully achieved without having been educated since infants to this composite essential activity that involves perception, reflection and evaluation at the same time.

Kant, a philosopher who, together with Peirce and Dewey, is among those who seem to me to be behind the concepts of DD, famously in his programmatic script *Answer to the question: what is Enlightenment?* promulgates the highest rule: he declared that human beings must

first determine themselves to emerge from the state of perpetual minority in which they were relegated to their self-understanding in the different contexts of the pre-Enlightenment world. That people were able to think for themselves was a goal to be contemplated and achieved by teaching them to do so while they were still students. Among the many passages of this essay it seems opportune to dwell on this.

It is therefore difficult for every single person to emancipate him or herself from the minority that for them has become almost a second nature. They have even come to love it, and at present are really incapable of using their own intellect, having never been allowed to test it. Rules and formulas, these mechanical tools of a rational use or rather of an abuse of its natural dispositions, are the shackles of eternal minority. Even those who succeeded in dissolving them would only make an uncertain leap even on the narrowest ditches, since they would not be trained in such free movements. So only a few have succeeded, with the education of their spirit, to extricate themselves from minority and yet walk with a sure step. On the other hand, that an audience enlightens itself is most possible; and indeed, if it is given freedom, it is almost inevitable. In this case, in fact, some free thinkers will always find themselves, even among the official guardians of the great crowd, who, after shaking the yoke of protection, will spread the feeling of the rational esteem of their own value and of the vocation of every person to think from the self.

The Enlightenment devalued emotional thinking and the development of a character beyond the opportunities for rational analysis of reality, so Kant's diagnosis and elaborate proposal still had the limit of wanting to achieve autonomy. This autonomy was characterized by a form of voluntary obedience of each individual to universally generalizable principles.

Rationality for Kant was therefore very different from rationality for broader conceptions of the person or the human, such as the classical ones of Plato, Aristotle, Thomas, Piaget or Dewey or the Oxford philosophers. These oth-

er authors gave greater emphasis to non-observable psychological events, such as personal narration, which have considerable philosophical relevance, even if they cannot be considered in the formula of universalizable maxims or categorical imperatives. It is impossible to formulate valid philosophical reflections, evading the inner life, the experience that determines our actions. Recovering the dialectical approach leads to consider the student as a potential thinker and moral agent *in fieri*, who, by exploring reality, conceptualizes it.

Modern ethical theories, even when they differ greatly from each other in the formal aspect, often share the assumption that my happiness, my full realization, and the happiness and interests of others can be examined in altogether distinct spheres of practical reasoning. A characteristic aspect of the *virtue ethics* is instead the peculiar declination of the golden rule (also known as the platinum rule) for which the good of others must be of import to me precisely because it is the good of others, not because it is part of my good or because it is reduced to my good.

The very notion of a person is different from this point of view: it is not the subject of liberal philosophy understood only in terms of the gratification that is achieved by the attainment of advantages. If the purpose is more broadly that of the realization and the telos is therefore that of the flowering obtained through the actualization of the virtues in concrete living, then I will also fulfill the precepts proper to the liberal society. From a formal point of view, tending to one's own *flourishing* is equivalent to trying to live one's life virtuously.

The practices of DD can therefore be observed starting from the influences derived from the reflections and the new approaches of contemporary philosophy, in particular the philosophy of education; on the other, it considers and proposes the frequentation of philosophy in its dimension of community-based social dialogue and activity, as was already the case in the central square of social activities in the ancient Greek *Poleis*. In this last understanding, philosophy translates into a practice, mainly in the philosophy-doing together in a space where the

meeting of ideas, reasons, values, arguments and personal and universal instances takes place and where education for thought is facilitated.

DD is characterized by the way in which it implements its didactic project centering it on the idea of research and knowledge as realities growing in the context of the research community, as well as practices that increase well-being and good community practices, in an increasingly fragmented society.

We would like to add to the intuitions grounding the DD and resuming Socratic paradigm some further reflection deriving from the philosophy of Fichte, as well as from the declinations that in recent years the Italian Philosopher Luigi Pareyson has offered in the Italian philosophical panorama. DD practice, understood as self-observation and self-determination, in the two meanings of the German term *Bestimmung*, to determine and allocate, can best promote the development of cognitive abilities, and helps students become more aware of themselves; has enabled them to think for themselves as to who they are, who they would like to be and in what world they would like to live. DD is grounded on the idea of encouraging their ability to work with others to invent new work tools, moved teachers to establish new relationships

DD realizes its educational project starting from an empirical (but at the same time reflective) analysis of the difficulties that students demonstrated in the formal and informal practice of logical reasoning to build a proposal for early education to thought, already in early childhood.

It is in the adolescent age that the wonder in front of the world is stronger, in which the spontaneity is expressing all its power and it is at that age that one can develop a philosophical attitude, irreducible to a disciplinary canon that allows a degree of greater freedom and fertility to interpret and know oneself and the world.

The question and the process of asking a process that is at the same time a pedagogical

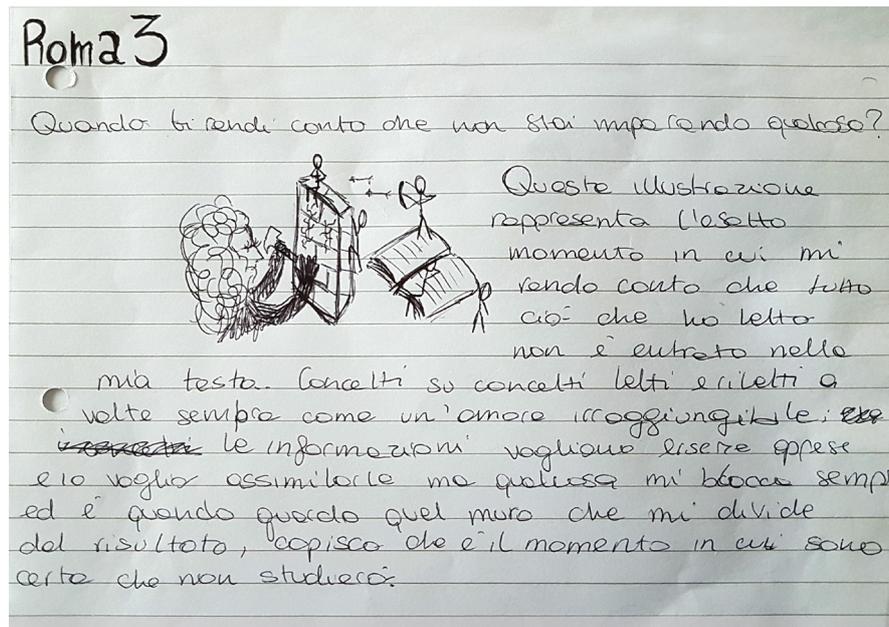


Fig. 1. The drawing is focused on the metaphor of the wall: this metaphoric wall is to be connected to The Wall, the Pink Floyd famous 1979 concept album, followed by the movie of 1982 directed by Alan Parker, where after being insulted by the teacher, the main character Pink dreams that the kids in his school begin to protest against their abusive teachers. This wall could be removed with the dialogical method of DD.

and dialogic one, is similar to the peculiar form of cognitive activity that the philosopher always subjects to the scrutiny of reason and critical reflection.

Complex thought and critical method constitute precisely the heart of learning that is realized with it moves in the three areas of cognition, meta-cognition and motivation. For these reasons the practice of DD in the community presents itself as a transversal activity compared to traditional curricular disciplines: offering practitioners, teachers and students the opportunity to acquire a peculiar method of philosophical research that, acting on the development of cognitive and metacognitive skills, crosses all curricular disciplines transversely, supporting their fields of knowledge.

## Decoding the Disciplines

Experiencing the Decoding the Disciplines (DD) methodology was very important for the students and also for the two teachers who participated in our session of the Project in

Rome in March 2018. The working group had three students and two teachers, including myself.

The three students with whom we interacted came from two schools: Reguel (22) and Francesca (19) from the Confalonieri Institute - De Chirico; Irene (18) from the E. Maiorana Linguistic High School of Guidonia.

We conducted a conversation of about an hour with the three students, who showed us their previous course of study, the choice of school and the last years of the second cycle.

The aim of the conversation was the in-depth development of the first of the 7 phases of the Decoding the Disciplines (DD) methodology, which consists in defining the obstacle to be overcome, determining the specific bottlenecks of some disciplines that are particularly difficult for the students.

The question "When do you realize that you are not learning something?" was asked in different ways during the conversation. and we

met some typical features and also some specificities of the individual discomforts towards the contents, the method, of the figure of the teacher.

The observation pertaining to the expert as required by the organization concerns the reaction of the students and the teacher to the request for the definition of specific hindrances of learning.

The three students and the two teachers immediately engaged in a fruitful dialogue, interacting without fear and narrating their experiences on the subject with ample and detailed narrative. During the written response phase following the conversation, the students produced three texts in which they explained their difficulties with regard to the individual subjects.

**Francesca** offered a drawing to be included in this article in which she effectively represents herself whilst trying to demolish the wall she feels has risen between her and *history*, the discipline with which she has most problems. History appears to her as a sequence of interesting and dynamic events, *res gestae*, which she however fails to memorize as she would like.

The drawing focuses on the metaphor of the wall: a wall like Pink Floyd's famous 1979 album of the same name. In this concept album, followed in 1982 by Alan Parker's movie after being insulted by the teacher, Pink dreams that the kids in his school begin to protest against their abusive teachers. The song talks about how he had a personal wall around him from the rest

of the world, and the teachers were just another brick in the wall. This wall can easily be removed with the practice of listening embedded in the dialogic method of decoding

**Reguel** has difficulty with the French language. Conversation in particular is difficult and she is unable to find a profitable approach to work under the supervision of the teacher. She also has difficulty with the study of Economics, in particular with the memorization involved in the bookkeeping, the demonstrations of theorems and complex concepts involved in economic theory.

**Irene** from the third year of high school had difficulties with mathematics and physics. After her difficulties in choosing which high school to progress to she believes that even in her choice of university degree, she will try to avoid University courses where these subjects are studied.

The two teachers interacted intensively with the three students, investigating together how teachers could be more sensitive, attentive and participant in fostering a better and wider use of the contents of the disciplines, joining it with deeper listening and a continuous effort of re-visiting the methodologies of the different disciplines.

History is a subject that is particularly suited to improve pedagogical strategies, because it involves (and at the same time could be the ground for further study of) all humanities and social sciences, concerning human communitarian activities, ranging from economics to anthropology, from ethics to political science.

# Decoding the Disciplines diversity, bias and emotions

Kristof De Craene

[kristof.dekraene@vives.be](mailto:kristof.dekraene@vives.be)

VIVES University of Applied Sciences, Belgium

*When we deal with a topic such as diversity, students aren't always aware that every student has prejudices or bias that may interfere with the learning process. Students don't always know that prejudices about diversity and the emotional impact this may have, may lead to difficulties in the learning process. If they realize that the subject may lead to an emotional state of mind, it leads to a better understanding of their learning process. By using the Decoding the Disciplines method students realize that the nature of the subject can trouble their vision.*

**Keywords:** bias, diversity, emotions

When we deal with a topic such as diversity, students aren't always aware that every student has prejudices or bias that may interfere with the learning process. The group of students is an Erasmus group with students from all over Europa. A great amount of students comes from different regions in Spain and Turkey. The fact that students aren't always aware that prejudices about diversity and the emotional impact this may have, may lead to difficulties in the learning process. So this course can not only deal with knowledge about diversity but it should also create an awareness with the students about how emotions may influence their learning process.

The biggest threat to the learning process (the bottleneck) is unconscious bias that can cause an emotional bottleneck. To quote the article by Middendorf, Mickute et al., "What's Feeling got to do with it": "Students' preconceptions about issues dealing with race, class, immigration, among others, and about the nature

of historical thinking can result both in a failure to understand course material and general disengagement from the class. It is important, therefore, when designing strategies for increasing student learning in history courses, to focus not only on the intellectual demands of the field, but also on the potential emotional obstacles that may derail the learning process." (P. 2) "When classroom experiences do not accord with students' expectations, emotional bottlenecks arise." (P. 7)<sup>1</sup>.

All of the students arrive in this course with a backpack that is filled with elements of their education as well at home, at school, media, that influences their opinions and pre-existing ideas about diversity in/and education. The students enter the classroom with a whole set of opinions and emotions that are a product of their past education. If those pre-existing ideas lead to contradictions with elements of this course, it may lead to emotional reactions such as anger, confusion, skepticism and even rejection

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<sup>1</sup> Joan Middendorf, 2014

of the teacher as is mentioned in the Mickute et al article. In fact the emotions as such are not the problem but the fact that students are not aware of the reasons why they feel some of these emotions is. They should realize that the nature of the subject can trouble their vision. If they are aware of the fact that the subject may lead to an emotional state of mind, this can lead to a better understanding of their learning process and may help to understand the reason of their emotions.

The awareness of the emotional component in the learning process about diversity is crucial in the learning process. It's almost a pre-condition to avoid conflicts and to make students self-aware. In order to help them to realize this, they'll have to learn about their own bias. Step by step, we will lead them into an emotional state of mind and try to detect in a very active way emotions. Whenever you teach something that may bring students out of their comfort zone, it's important to create a relation of trust with the students. The students should feel safe to talk about their opinions.

The group of students was a mixed international group and it was my first class in this group and the subject itself is also a new subject for me. I thought it was a good idea to explain to them the methodology of Decoding the Disciplines and to tell them why they were being filmed. By explaining this methodology I went into the subject of emotions in relation to the topic of diversity. First of all, we discussed the meaning of the term diversity and the direction this class was about to go. Then we did some practical exercises with the students to break the ice and to gain trust. Then we took a look on how diversity is everywhere in all of our lives. We did this by creating exercises where students see the similarities and differences within the group. At first, we started with rather emotionally neutral forms of diversity such as growing up with brothers and sisters, growing up alone. Living in the city, living on the county side and so on and so on. Then I asked them questions on their emotional reactions towards this kind of diversity. In a second step we went into more personal and moral questions. Because of the

nature of the questions, the emotions came up. One of the students even started crying. Then the question of the emotions was investigated again and we went into the reason of the exercise and the emotional nature of the questions. Creating an awareness that bias may create an emotional bottleneck was the goal. They were capable of detecting their emotions and realizing the emotions were caused by bias. Then the rest of the class about diversity followed.

It was important to motivate the students and to address the affective side of learning. The group of students was new to me, so I've started the class with explaining them the topic of the course 'Diversity in/and education'. Because it was a group of Erasmus-students that never saw each other before, I thought it was very important for them to get to know each other a bit better because some of the topics that we were about to discuss in the rest of the year might be sometimes way out of the comfort zone of the students. I have explained this to them and I have also told them that I wanted to try a methodology that was new to me. When I've asked the students about it, none of them had ever heard about the Decoding the Disciplines project. I have explained them that the project itself also would be a learning process for me. I have told them that we would work on a pace that allowed every student to keep track with the steps of the decoding methodology. Then I started the class by explaining the methodology by making the steps of the methodology explicit while we were doing them.

When it comes to unconscious bias, it's difficult to measure if they got more aware of their own bias. But at the end of the class, they told me that they realized much better than before that they had to be aware of their own bias and some students told me that they always thought that they didn't have any prejudices but that they now realized that they had bias as well and the most important aspect for me was that they realized that bias can cause emotional resistance towards an open attitude when discussing and learning about diversity in education.

I will apply the methodology in my courses in teacher training in the VICKIE-program for incoming Erasmus students. I have shared the decoding methodology with my colleagues.

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# Bottlenecks in research training: case-study of an interdisciplinary taught postgraduate course

Peter C. McKeown

[peter.mckeown@nuigalway.ie](mailto:peter.mckeown@nuigalway.ie)

National University of Ireland Galway, Ireland

*In this case study, Decoding the Disciplines methodology was applied to enable taught postgraduate students to understand research hypotheses and how they are tested in an unbiased manner, as an aid to applying these proficiencies during their Masters Theses. The approach taken applied modelling the hypothesis-generation process described in relevant literature, followed by critical reflection sessions. Students also interfaced with a guest expert experienced in resolving related problems. We consider the process of strengthening student engagement with impartial and meaningful testing of research hypotheses and the general utility of this approach at other levels of higher education is explored.*

**Keywords:** Decoding, hypothesis, research, student, interdisciplinary

## Introduction

Decoding the Disciplines has been promoted as a means of enabling students to gain mastery over the key activities within their disciplines in other words to “[introduce] students to the culture of thinking in a specific discipline” (Middendorf & Pace, 2004). In its applications to date, Decoding methodologies have been deployed particularly within the framework of threshold concepts (Shopkow, 2010). Hence, Decoding practices are a powerful approach for helping students to overcome bottlenecks associated with their professional development, so may be of particular utility for postgraduate and interdisciplinary programs.

Part of the defining characteristic of post-graduate (PG) education is that students participate in knowledge-creation of some form, generally within the context of research activities. As few students are likely to have

engaged in meaningful research before this (despite efforts to embed true research activities within undergraduate curricula), there is a particular relevance of Decoding to PG courses. A further point which has been less remarked upon is that one of the original aims of the Decoding approach as advanced by Middendorf and Pace (that the use of Decoding would aid social mobility by levelling the importance of prior experience) also implies particular relevance for inter-disciplinary courses (Middendorf & Pace, 2004). In other words, in courses where students may come from different backgrounds and/or feeder courses, attainment of common learning outcomes and graduate attributes will require threshold concepts to be addressed with care.

In this context, we sought to apply Decoding approaches to a Masters Program in Climate Change, Agriculture and Food Security (MScCCAFS) which is run by the National Uni-

versity of Ireland's Ryan Institute in partnership with the CGIAR CRP on Climate Change, Agriculture and Food Security (CAAFS) – <https://ccafs.cgiar.org/nui-galways-masters-degree-program-climate-change-agriculture-and-food-security-msccafs#.XKJ5JXx-7nIU>. The MScCAAFS is a 1-year taught Masters course (Level 9 course, European framework). This is a fairly new course, and for the past three years, classes of 18–20 have enrolled in the MScCAAFS. As defined above, a level 9 postgraduate course such as the MScCAAFS requires a substantial research element, and accordingly incorporates a 30 ECTS Research Project as a core element of the curriculum (30 ECTS equates to *circa* 600–725 hours of student effort). However, it was identified that student performance could be improved through greater understanding of the nature of what was to be achieved in a research thesis. This was related to the articulation of the 'testable hypothesis' as a threshold concept within pure scientific disciplines (Taylor & Meyer, 2010) and could be colloquially expressed as helping learners to not only carry out research but to *think like researchers*.

This threshold concept led to the formulation of a bottleneck which was addressed by the use of Decoding the Discipline as described in the body of this paper.

### **Theoretical background: the bottleneck**

The field of climate change teaching is, of its nature, an interdisciplinary one, encompassing social scientific analysis of communities who are vulnerable to climate change impacts; understanding of atmospheric models; and a grasp of political, economic and policy frameworks. The challenges of teaching such a diverse curriculum have been addressed in different ways at different institutions (Davison et al., 2013; Pharo et al., 2012) while in many other institutions, the subject remains under-taught relative to its significance. In the course in question, a particular focus is made on the impacts of climate change on agriculture and food security, and on the

communities who are dependent upon these. A particular focus (in line with the legal mandate of the CGIAR) is on those populations and countries who are most vulnerable, especially in the developing world. The MScCAAFS incorporates a 30 ECTS research project as described above, which typically involves a student spending a three-month research placement at a CGIAR centre or other host partner organisation, carrying out other preparatory activities (such as a comprehensive literature review) while based in Ireland, and final writing up a 30,000 word thesis based on their research. Students also maintain weblogs of their research interests and activities which can be viewed at <https://plantagbiosciences.org/msccafs-students>. The research project module is supported by a 5 ECTS 'Research Techniques' module which provides training in use of relevant skills (statistics packages, GIS, surveys and key informant interviews, handling of qualitative data, and technical writing).

It was identified by the teaching faculty that students sometimes struggled to appreciate the concept of what research in technical, policy-related and sociological disciplines consists of, and in particular the essential importance of generating novel data to test a hypothesis. Hence, this can be considered an epistemological bottleneck with respect to the nature of knowledge construction in the relevant discipline. Staff associated with the MScCAAFS worked with colleagues from the NUI Galway Centre for Excellence in Learning and Teaching (CELT; <http://www.nuigalway.ie/celt/>) to determine why the bottleneck might be arising and to consider options to address it within the context of the Research Techniques module and of the Decoding program over the course of two years.

In the first year, the Decoding activities explored the concept of the research hypothesis, and how it can be tested. Following feedback from students, discussions within the faculty committee and consultation with CELT the activity was then further developed. A key element in developing hypotheses (and methodology to test hypotheses) is full consideration of researcher bias – in the fields of climate change,

agriculture and food security this is particularly true with regards to gender bias. Indeed, the CCAFS CRP contains a flagship dedicated entirely to Gender and Social Inclusion (<https://ccafs.cgiar.org/flagships/gender-and-social-inclusion>) which uniquely is considered cross-cutting across all other flagships as well as having its own work program.

Research in the inter-disciplinary topics covered by MScCCAFS can have many implications for communities, especially climate-vulnerable agricultural groups, and many student MScCCAFS research theses involve working with such groups to assess their resilience in the face of climate shocks or the forms of climate-smart agricultural practices which would increase this resilience. In many parts of the developing and emerging world, female smallholders face are particularly at risk from climate change, so it is critically important that the need to consider this is borne in mind in the course of developing research hypotheses. This is in addition to other forms of social inclusivity (including inter alia age, ethnicity, religion, caste, membership of sexual minority groups, and membership of an indigenous people), all of which are also intersectional. Therefore, MScCCAFS student projects not only need to be designed with robust, testable research hypotheses, accompanied with appropriate methodology for testing them, but also need to be drawn up in the fullest possible awareness of bias and the need to consider gender dimensions to research.

To address this further, in the second year, Decoding was not only applied to the concept of the hypothesis but to the implicitly related question of how a hypothesis can be tested in an unbiased manner. This also brought greater alignment between the Decoding activities and the broader aims of the European Decoding the Disciplines Erasmus project, which provided support to these activities.

## The process

To model and practice the mental operations, students were taken through the process

of research development, including the process of developing hypotheses, aims and research objectives within grant proposals, as “working” researchers do. Different classes of hypothesis were considered, together with summaries of the theories and assumptions underlying them, and the criteria by which it could be determined whether the hypothesis was tested, or not, were also discussed (this included consideration of the need to apply statistical tests to draw robust conclusions from quantitative data, which helped to provide a sound basis to the subsequent statistics training). To practice putting these processes into effect, students were assigned papers from relevant literature to study, and made informal presentations before their peers in which they described whether a hypothesis was tested, and if so what and whether the claims made by the authors with respect to the conclusions of testing them were robust. The papers provided were deliberately chosen to address a range of relevant topics, to be drawn from different classes of literature (some peer-reviewed, others opinion pieces, others still from the so-called ‘grey’ literature). In addition, the papers were chosen to represent what were, in the coordinator’s view, a range of positions along the quality spectrum, with some papers deliberately chosen because their hypotheses were unclear or conclusions of questionable soundness.

As described above, this process was expanded and refined in the second year in which the Decoding activity was deployed. Students were again taken through the process of research development, including the threshold concept of developing testable hypotheses, and of the importance of developing clear aims and research objectives (using examples from within grant proposals, which were foremost in the mind of the instructor at the time). This was then however augmented by a consideration of the need for taking account of possible bias in the course of testing hypotheses, with particular emphasis on the forms of bias likely to arise in their research. Students had been prepared to consider the gender (and wider GSI) implications of CCAFS research with a dedicated module, Agriculture, Gender and Climate Justice co-

ordinated by MScCCAFS faculty with expertise in these areas and by visiting experts. To specifically address research bias and how it can be dealt with, a guest lecturer with extensive experience in gender-sensitive social research in international development provided a remote seminar using the video conferencing facilities which have been established in the Plant and AgriBiosciences Research Centre, including interactive activities and Q&A.

To practice putting these processes into effect, students were assigned papers from relevant literature to study, and made presentations before their peers in which they described the hypotheses tested, and if so what and whether the claims made by the authors with respect to the conclusions of testing them were robust. A specific section of the presentation focussed on what issues relevant to gender and social inclusion impacted on the hypothesis, methodology or conclusions; and if so what steps, if any, had been taken to address these in an unbiased manner. A general discussion of best research practice arose.

### **Feedback and outcomes on the activities**

Students' backgrounds were assessed prior to initiating the Decoding sessions. The classes were multi-disciplinary, including students with backgrounds in agriculture, agronomy, psychology, geography, urban planning, engineering, food science, and international development practice. The students were roughly split between those defining as male and female, and between those with European citizenship (and usually ethnicity) and those from other regions of the world, including approximately twelve countries in total (China, USA, South Africa, Malawi, Zambia, India, Saudi Arabia and Pakistan).

Student presentations were filmed to facilitate collation of responses and feedback. The students deployed their knowledge within their research theses, applying their data to the testing of their hypotheses. These were developed

within the context of drawing up broader research aims in collaboration with course faculty and placement co-supervisors.

To ensure the students were working towards addressing the Thesis Objectives and Milestones which would enable them to test their hypotheses, it was decided that student should send brief weekly email updates describing their progress. Draft Theses were required to be provided to all supervisors and co-supervisors well before the submission deadline to allow timely feedback to be provided on the Discussion and Conclusion sections which had sometimes been less well addressed in previous years. The quality of the theses was adjudicated by the faculty, co-supervisors in hosting partner institutes, and through the external examiner. The quality and grades of the research theses was found to have improved. Other issues were however noted: even within a small class, there was considerable diversity in background and students who had previous research experience did not by and large benefit from the process. In addition, the process was intensive in terms of time commitment from both students and staff which was considered to pose a challenge in terms of scaling the approach to the bottleneck, for example with Honours year undergraduate classes.

Follow-on materials were provided to students to reinforce the messages of the four Decoding sessions themselves, including self-study activities considering the gender balance statements and processes provided by Irish research funding agencies, and how these could guide best practice. To ensure the students were working towards addressing the Thesis Objectives and Milestones which would enable them to test their hypotheses, students continued to send brief weekly email updates describing their progress according to a template provided. Draft Theses were required to be provided to all supervisors and co-supervisors well before the submission deadline to allow timely feedback to be provided.

Feedback was collated from the students who had undertaken the exercise through a

follow-on questionnaire. The quality of the theses was adjudicated by the faculty, co-supervisors in hosting partner institutes, and through the external examiner and overall quality again considered to have been strengthened. Gender and social inclusion issues were generally found to have been appropriately incorporated within the focus of research theses and in one case a student published a peer-reviewed paper on this topic with one of her supervisors after graduating ([www.tandfonline.com/doi/full/10.1080/09614524.2018.1556608](http://www.tandfonline.com/doi/full/10.1080/09614524.2018.1556608)). Students shared the knowledge with other students, faculty and colleagues through a conference/symposium held at the end of the academic year. Posters which presented their research aims were also produced and exhibited at a relevant international conference hosted by NUI Galway in 2017 (<https://www.ccafs-scientific-conference.org/>)

The process of developing appropriate Decoding methodology for this course remains subject to ongoing development – for example, more careful consideration of students' backgrounds might assist in tailoring the Decoding activities to the class. Language of prior instruction was never considered when collecting preliminary information on the class, nor (perhaps more importantly) their disciplinary backgrounds. It is possible to conceive of interactions with age, religious affiliation and the extent of work experience, if any. Notably, one somewhat negative comment was received in feedback following the year 1 activity, from a student who had previously performed a more purely-scientific masters course and considered that little additional had been learned. The value of reinforcing threshold concepts should, of course, be considered, and there might have been a more positive response had this been expanded to the second-year focus on bias which might have been less familiar. The question of bias within the course described clearly relates to much larger issues relating to the biases which may be implicit (or indeed explicit) within the broader framework of interna-

tional development research narratives; this is a complex issue and no attempt will be made to address it here, but will form the basis for future more considered analysis.

## Conclusion

Application of the Decoding methodology to research techniques has been proposed previously (Sundt, 2010) but remains to be widely deployed, especially in technical and scientific courses, or in inter-disciplinary teaching. We do not believe that the bottleneck we identified among our students is unique to them – quite the contrary. As undergraduate courses increasingly reduce the amount of time dedicated to meaningful research activities due to ever-greater constraints of time and resources, the use of Decoding to prepare postgraduate or conversion-course students for careers as independent researchers (or indeed as professionals who take responsibility for accurate knowledge-creation of any kind) is an attractive model. We suggest that early engagement in understanding of unbiased hypothesis testing will help the generation of high-quality research from postgraduate students more generally. Whether such approaches can facilitate doctoral student research in a similar way remains to be determined and will be an interesting question to address in the future.

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# Decoding the Disciplines, the meeting point between learning and learners

Amelia Mori

[amelia.mori@uniroma3.it](mailto:amelia.mori@uniroma3.it)

Università degli Studi Roma Tre, Italy

*Teachers, especially in the higher levels of education, complain about the students' inadequate and superficial preparation, especially in the phases involving complex cognitive operations. Students find a lack of dialogue from teachers in moments of difficulty: the bottlenecks arise in the flow of the teaching-learning process. The Decoding the Disciplines methodology aims to tackle this issue, trying to identify the problems and the ways to overcome them. The Erasmus Plus conference of March 12, 2018, held at the Roma Tre University, brought together exponents from different level of education and students to discuss the efficiency and effectiveness of the Decoding the Disciplines methodology.*

**Keywords:** bottleneck, communication, Disciplines, learning

## Introduction

Bloom, in his theory of *Mastery Learning*, since the sixties has shown that the focus of learning should not be the teacher, nor the discipline itself, but the student and the methodologies adopted to promote learning; the methodologies should be effective in stimulating the interest and curiosity of the students, without neglecting the importance of receiving continuous feedback, useful for the eventual reorientation of the didactic action. There are teachers who complain of a lack of effective understanding of the topics and issues presented, as if the students were not equipped on a cognitive level to fully understand some disciplinary content, whether scientific or humanistic, or as if teachers and students did not share a unique specific disciplinary language code. Is it therefore a students' cognitive problem? Of course not: it is an absolutely more complex problem. It is known that some very experienced teachers at the disciplinary level, may encounter considerable difficulties in communicating with their students, failing to trigger the spark of motivation

and interest in the subjects or in the discipline in general. But what happens at some point in the school career of many students? Why do brilliant students often begin to encounter serious difficulties in learning certain disciplines? The so-called *bottlenecks* appear, some points of blockage in the learning of certain disciplines, and the communication between teachers and learners fades. The students slow down strongly leading to lack of motivation, a fall in self-esteem and self-efficacy perceived by the students.

## Theoretical background

This relevant issue has been addressed by international experts within the *Erasmus Plus project*, which analyzed the potential of the *Decoding the Discipline* methodology and the potential impact on teaching of different disciplines. The problem persists at all levels of education; the higher the school level, the greater the difficulties encountered by students in developing meaningful and lasting learning;

especially in the phases in which the activation of cognitive processes of a higher level is required, tangles are created preventing the flow of learning, in line with the teacher's expectations. But the study of any discipline goes through passion, curiosity and interest in learning; *Decoding the Disciplines* is one of the pedagogical methodologies that raises the problem of identifying the most appropriate didactic strategies, according to the different intelligences and learning styles of each student, in order to promote success for everyone.

The aim is that every single student can find a fitting method to build an effective learning in each discipline, grasping the profound meaning and avoiding the frustration of penalizing results and intellectual and social ghettoization. The purpose is to overcome those *bottlenecks* that create a short circuit in the teaching-learning process.

The *Decoding the Disciplines* methodology highlights students' difficulties, helping them to identify obstacles and appropriate strategies for overcoming them. In the analysis of the learning process it is clear as how each discipline is characterized by its own peculiarity that makes it different from other ones. Learners should approach each of these with an active and conscious method for the construction of concepts and in this process the role of teachers should be to make every notion and every passage accessible and easily understood by everyone. To this end *Decoding the Disciplines* has indicated seven fundamental phases useful for dealing with problematic situations:

- identification of problem areas, such as *bottlenecks*.
- identification of cognitive operations that are involved in the learning of a discipline or in a specific task.
- modeling of the steps necessary for the completion of the task by the students.
- preparation of the actions necessary to perform the task and the feedback during the process
- analysis of the motivational, emotional aspects that emerge during the study activ-

ities, so that students can become aware of the encountered difficulties.

- use of assessment tools to receive data on the mastery achieved by each student.
- sharing of learning.

Especially in the field of university teaching the problem can become relevant and the teachers who accepted the invitation to embrace the methodology of *Decoding the Disciplines*, have also followed a training course and have accepted the evaluation and self-evaluation of their work, especially regarding the ability to communicate the contents of the taught discipline. The students who took part in the project were allowed to express their own point of view, through an anonymous online questionnaire in which they could outline the difficulties and bottlenecks encountered during their academic course.

## Applying the Decoding Methodology

The purpose of the *Erasmus Plus Event* that took place on March 12th, 2018 that was held at the *University Roma Tre* was to bring together the various actors of the training process (university professors, principals of Institutes of Higher Education, experienced teachers – who were observers –, university students and high school students) in a meeting aimed to foster dialogue, during which everyone had the task of sharing their different points of view about this important issue. They were to look for a point of convergence of ideas and opinions in order to discuss together the potential for efficiency and effectiveness of the *Decoding the Disciplines* methodology. The high school principals, during the discussions held in small groups, played the role of animating the conversation with the students in order to bring out the difficulties they were encountering – or had encountered – in the study or in the relationship with their teachers.

The guided conversations in the small heterogeneous groups led to interesting food for thought that was discussed at the end in a plenary session. Being in a *bottleneck*, the students

reported, was neither difficult nor rare and the motivations were various, not only for personal problems directly related to the study, but also because it happened that some teachers carried on the program in a way that was disconnected from the contents of the other disciplines, without following a logical unifying thread; and this issue could, according to the students, generate confusion and disorientation so that the attempt to reorganize all the disconnected elements in a logical framework could be difficult and tiring, because they had to do it by themselves. They all shared the feeling of frustration of being left alone to face it without any support.

The students perceived that the teachers in general had a closing attitude, a lack of empathy and willingness to listen, even if they had turned to them to receive further explanations or support. They stated that, during the lessons, the relationship had a unidirectional dimension: the professor was the one who explained, without the need for a circularity of the of didactic communication system, so the possible difficulty of the student was perceived as a problem that did not seem to concern the teacher. This phenomenon generated demoralization and self-blame so that students consider unnecessary, or even counterproductive, to seek support from teachers and therefore they prefer, in case of need for further explanations, to ask for help from their classmates and peers. In addition, the students from the Italian *Istituto di Istruzione Superiore Con-falonieri-De Chirico* and *Istituto di Istruzione Superiore Guidonia Montecelio* referred to a phenomenon that occurs above all in the case of new teachers who take over the class: they do not yet know well the context, the students and the topics previously studied, and most of them are still used to avoiding analyzing and taking into account the prerequisites, preferring to go on with their program and explain new topics with the consequence of leaving significant gaps which every student has to try, with difficulty, to recover by themselves.

These students all highlighted the feeling of not being adequately taken into consideration

and that their requests for listening and compensatory teaching support were accepted only after the intervention and the formal request of their parents, as a consequence of an individual meeting. In addition to the specific didactic problem, related to the teaching of the discipline, these students also highlighted a lack of empathy, even when they met some teachers to receive moral support in moments of personal difficulty; it happened that they got a cold and detached welcome, while they would have expected to receive encouragement and help. The idea that these students expressed is that, according to them, many teachers see the class as a homogeneous and unique entity, not made up of individual identities, characterized by different formative needs.

The principal, after having listened with attention and interest, appreciated the students' statements and underlined some fundamental points to integrate the analysis on the possible causes that may lead to *bottlenecks* and focused on the applicability and effectiveness of the *Decoding the Disciplines methodology*. According to him, in general, teachers have an undisputed competence at the disciplinary level, but some of them often need a thorough methodological-didactic training, and this can be an issue that may cause obvious learning difficulties and *bottleneck* and it may even cause communication problems with the students due to their attitude of refusal. *Decoding the Disciplines* can be a valid methodological support that can be shared in an alliance of formative goals in agreement with the students' families.

## Conclusion

The following discussion in plenary highlighted points of convergence leading to the shared belief that introducing and proposing this methodology, has brought to light and to the public attention of the academic world the existence of an effective and a real problem consisting in the adequate learning (and teaching) of the disciplines. Implementing and applying the *Decoding the Disciplines methodology* shows the will and the intention to solve

this problem, offering a helping hand to the students in order to overcome the learning difficulties, *the bottleneck*, that may occur both in literary and scientific disciplines, with positive echoes also for the communication between teachers and learners.

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# Decoding the Disciplines and promoting life skills

**Stefania Petrera**

[stefania.petrera@uniroma3.it](mailto:stefania.petrera@uniroma3.it)

Università degli Studi Roma Tre, Italy

*The methodology Decoding the Disciplines has the strength of demonstrating that transversal skills and competences can be acquired in all disciplines: focusing on their teaching and learning will enhance the disciplinary aspects. Centering the didactic action on procedural competences, teaching them explicitly allows, in fact, to make a drastic cut of declarative knowledge in favor of procedural knowledge and transversal skills/competences, focusing on cognitive styles and individual learning processes, rather than on the tasks and blackouts that derive from their failure to resolve. To support the construction of transversal competences, therefore, it is necessary that they be integrated into the curricula, not so much as to add new goals as to construct the material conditions of an effective didactic practice.*

**Keywords:** bottleneck, Decoding, life skills, future, right of learning

## Introduction

Even in the third Millennium education means acting with intentionality to let young people become master of strategies to decode the characteristic elements of the socio-cultural scene in which they are immersed, with the final goal of guiding them to become responsible citizens and protagonists in creating their own future. Teachers and socio-psycho-pedagogical workers continue to face increasingly complex challenges, that come from the contemporary educational background in which traditional formative opportunities and educational and pedagogical innovations coexist. For this reason, it is necessary to support them in developing the awareness of their own professional identity which, in the current historical context, represents a useful, necessary and basic competence to solicit the growth of their pupils.

## Theoretical considerations

In traditional teaching, declarative knowledge – that is the facts, the data and the no-

tions have been, to a large extent, privileged to the detriment of procedural knowledge, which concerns the logical and methodological processes, which each one carries out to approach new elements of knowledge. In this framework the Decoding the Disciplines project should be placed, with a fitfully logic, as it concerns the knowledge and application of the homonymous pedagogical methodology. That is, to urge the university professors and teachers of educational institutions – first and secondary schools – to teach their discipline effectively, learn to examine with the pupils the difficulties that they face during the study of the numerous and diversified conceptual frameworks they approach through experience at school.

The basic statement is that disciplinary knowledge provides transferable knowledge – that can be used in different contexts – that will be transformed into action skills when they are privileged and stressed the knowledge and the awareness of communicative, cognitive and metacognitive skills, that each pupil can reach, even in a thorough form, but the interest to reach these skills is not always revealed.

Considering these learning difficulties, the main role of teachers is to identify the bottleneck, the obstacle that prevents progression in the autonomous learning process. By helping the pupil to break down individual skills into smaller ones – intended as a capacity to apply sectoral knowledge and delimited to a certain disciplinary field to carry out an activity – teachers facilitate their pupil's access to the disciplinary complexity that, when segmented into parts, becomes easier to learn.

Considering the *bottlenecks* that can be overcome and by decoding the disciplines, teachers and pupils, together, may analyze the nature of individual obstacles that slow down or divert learning. It becomes possible to focus clearly on what individuals can “Do” to learn and seen what they have failed to understand.

Finally, in combination with the dialogical issues, the planning of meaningful learning opportunities is also crucial, with the support of materials appropriate to the typology of the educational activities to be carried out.

### Applying Decoding at the Multiplier Event-Erasmus Plus

In order to complete the subject so far, it seems appropriate to insert the report written during the Multiplier Event-Erasmus Plus “Decoding the Disciplines in European Institutions of Higher Education: Intercultural and Interdisciplinary Approach to Teaching and Learning” – which took place on 12<sup>th</sup> March 2018 at the University of Rome Tre in Italy.

The working group included: the school manager of the I. C. “Rocca Priora” Dr. Laura Micocci, the expert Dr. Stefania Petrera, Tutor of educational internships at the Bachelor of Science of Primary Education of the University of Rome Tre, student D. C. enrolled in the fifth year of the language school “Ettore Majorana” of Guidonia (RM) and student N. R. enrolled in the Technical Institute for Graphic Design “Confalonieri-De Chirico” in Rome

During the activity of analysis, implemented through the methodology of decoding and focal questions, we focused on the need to identify factors that hinder the motivation to learn and knowledge of disciplinary frameworks planned by the school curriculum.

The discussion and comparison of different views revealed numerous concepts of evident pedagogical relevance. In particular it was established that:

- for the purpose of academic and formative success, a great role is played by the effectiveness of the relationship established by the teacher with their pupils, while takes into account the individual characteristics and complexity of the different disciplines of study;
- the school career shouldn't involve methods of mnemonic learning but effective learning strategies to learn to decode, in a critical form, the disciplinary contents, especially the most difficult ones;
- studying philosophy is useful because it stimulates our thought, it matures a self-reflective ability and provides tools to interact with the outside world; so it is very concrete and not abstract.
- foreign languages and humanistic subjects are considered more interesting by young people than scientific ones, especially for the methods by which their study is proposed;
- the frustration of not understanding specific or individual disciplinary content leads to not studying the subject and losing interest for in depth analysis;
- there is a difference between interest and curiosity: interest activates the research of an answer; curiosity is connected to the motivation to learn;
- interest in a subject generates a higher level of positive results for the student;
- if knowledge is really strong it remains over time and this happens because it has produced skills;
- in terms of motivation, the evaluation has an essential role because it gives gratification to the student who, following the attribution of positive evaluations, sees

that the teachers have contributed in building their knowledge.

- sometimes the study of certain subjects is related to the test that is given and this can influence the interest for the disciplines.

## Student-Teacher Decoding Interviews

Here is the report of the conversation articulated into questions, asked by the school manager, and the answers of two students belonging to the working group:

*Q.1) Why do you think teachers and students find it difficult to learn and teach?*

Student Q: "The topic of discussion is important. I personally do not have a good approach with maths because I prefer other subjects (foreign languages and humanistic subjects are more interesting thanks to the methods used to study them)."

*Q.2) When do you meet the block, the difficulty in learning? Where do you start from to locate your learning blocks?*

Student N: "I have always had problems with all the scientific subjects that I have studied extensively, and which are widely present in the curriculum of the language school. I did not know when I chose the secondary school address. With regard to Maths, I can't find a practical use to the problems that the teacher gives me. Mathematics is stable, it follows fixed rules, it doesn't fascinate me...Even the teachers of the scientific subjects I met were not charismatic. In the first year of Middle school when I studied Algebra I came to understand my difficulties in the study of maths and science."

Student D: "The frustration of not understanding leads you to not study the subject, you lose interest in your study. There is a difference between interest and curiosity because interest leads you to search for answers, while curiosity is the personal thrust towards knowledge. I think they can merge together because curiosity is the first activator for studying."

Student N: "I think the opposite regarding what D said."

*Q.3) Tell us a specific situation of difficulty that you have experienced*

Student N: "I had to work hard with the English notes because I don't agree the mnemonic way chosen by the teacher to let us learn the concepts. I have difficulty learning content by heart. For me it is important to study philosophy, which to most people seems unnecessary and doesn't have a practical application. I think that studying philosophy is useful because it stimulates thinking, it matures a self-reflective ability and provides tools to interact with the outside world, so it has an operative value. Surely, however, I have a prejudice toward mathematics to which I don't recognize any practical value or intrinsic usefulness. I tend to immediately forget a concept that for me is of no interest. I have selectivity towards the contents that are given to me at school. In middle school the mathematics teacher valued those who were already good and left the others behind, among whom I was. In the three years of middle school I never felt followed nor appreciated. When I turned to secondary studies, I still liked maths but by then I had accumulated too many gaps and I wasn't able to follow the explanations and lessons."

## Reflections of the observer

Student N has had a kind of "homeopathic" reaction passing from a rejection suffered to a conscious refusal while for Student D the school curricula should not impose learning by heart how to decode. For example, studying Leopardi's poem by heart does not necessarily bring to understanding its philosophy.

Sometimes not understanding also derives from lack of knowledge and rules, from previous gaps. In learning it is good to proceed in progressive steps. The role of the teacher is important not so much for the study of the subject as in the first phase of presentation of the disciplines. It should be assessed for the interest

it is capable of presenting them in an interdisciplinary way.

## School Manager Exposition

The difficulties in learning and teaching are, to a large extent, linked to the quality of relationships between pupils and teachers. A great role is played by the effectiveness of the rapport, while taking into account the individual characteristics and complexity of the different disciplines.

Student D: "The interest in the subject generates a higher level of performance and the teacher's positive evaluation plays a key role in terms of motivation (student satisfaction). Sometimes the study of the subjects is related only to the contents of the final test and this can influence the interest for the subject. You can't study just to get a good mark on the classroom test. If knowledge is solid it remains such over time because it has produced skills (for example my mother once didn't help me in a task because she would have had to restudy the disciplinary content to which she was referring). I have always been among the best in the class and I have no rejection for scientific subjects: it is mathematics that has no appeal for me (I have still to find an interest in mathematics!) My *bottleneck* relates to an episode concerning my physics teacher who gave me and my friend the same task to complete. I was the one who actually did the work, but my friend inexplicably got a higher mark than I did. Out of spite, for two weeks, I didn't study any physics!"

## Conclusions

It is now clear that for the autonomous forming of knowledge, skills and competences- only an intellectual approach is not sufficient because meaningful and self-directed learning is based on specific and targeted experiences, which find the synthesis in complex constructs through the successive and recurring processes of recapitulation. So much so as to reiterate that the methodology Decoding the Disciplines has

the strength to demonstrate that transversal skills/competences can be acquired in all disciplines: aiming at their teaching/learning will be valued all the Disciplinary resources.

Focusing the didactic action on procedural competences, teaching them explicitly allows, in fact, to make a drastic cut of declarative knowledge in favor of procedural knowledge and transversal skills/competences, focusing on cognitive styles and individual learning processes, rather than on the tasks and blackouts that derive from their failure to resolve. To support the construction of transversal competences, therefore, it is necessary that they be integrated into the curricula, not so much so as to add new goals as to construct the material conditions of an effective didactic practice.

Thus, proceeding like this, the outcome will be a self-directed learning process centered on the mastery of a complex construct by the subject, in which the declarative knowledge, procedural knowledge and personal aptitudes are interconnected. Therefore, the decision of the method of approach to disciplinary knowledge (and not only!) appears to be decisive. Starting from simple and simplified knowledge, both declarative and procedural, (each of which is teachable, measurable and evaluable) and by guiding students to decode them, and then aggregate them, the latter will be able to acquire more and more complex knowledge, skills and competences that can transfer to other disciplinary fields, in contexts and in situations progressively more distant from those in which they were learned.

The reflections so presented are an engagement with the recent statistical studies that highlight the data of one million and eight hundred thousand Italian high school students that gave up during their studies, intending for school dropout the sum of school dropouts and of students that repeat the school year. As a matter of fact, the figure is estimated by experts to be higher because the majority of students that drop out, leave the Education system without their families communicating this officially to the schools, which in turn do not inform the

ministry of Education, University and Research. This happens because the parents are disinterested in school life, which is also the cultural life, of their children.

To complete the analysis, it is necessary to highlight the opposite phenomenon to school drop outs and that is the easy way to go into the next form despite the detection of substantial deficiencies in some disciplines. If in the near future we will not intervene effectively, the repercussions of this situation will be on the economic and social level, therefore in the training of the new managers.

In order to overcome the impasse and restore to the school, as an institution, the role of guarantor of the right to learn, as well as the right to study, the decoding the disciplines methodology can be considered an effective tool for containing the dropouts caused by frustration, discouragement and wrong choices made with regard to academic choices. In the school context, when the teacher succeeds in integrating their disciplinary skills with communicative and relational competences, they conquer the “expert power” to allow each of their pupils to discover and use their skills to the fullest.

In this regard, it is necessary to support the youngest to mature metacognitive skills and strategies, which allow each person to better know their cognitive style and others, but also to practice to act autonomously in the future (through activities of prediction and design),

to analyze the past (monitoring the experiences) to learn to self-evaluate and to enhance themselves. It is useful to remember that the terms “evaluate” and “valuing” have a different meaning: to evaluate oneself means to attribute a value; valuing means highlighting your own value.

Achieving the awareness of the logical path followed to process the information you are exposed to and to interact with reality affects the ability to assume responsibility for your decisions. From it also derives the mastery of corresponding the requests made by third parties, adopting divergent modalities and demonstrating learning to learn. All this reinforces the security of being able to implement both the strategies necessary to solve a specific problem, and to apply them to a wide range of unknown situations, enhancing!

Moreover, the ability to be reflective represents the level of knowledge needed to achieve personal autonomy and self-efficacy, life skills to be implemented by those in distress and those who have already developed flexible modalities and creative interaction with the contexts of life. In meaningful educational and scholastic paths, the solicitation of teachers and educators must also aim at assisting meta-emotional, personal and social strategies that allow students, of all school levels, to achieve self-awareness and personal value, self-control, motivation to learn and the ability to relate with others in an empathetic, constructive and collaborative way.

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# Decoding the Disciplines: the voice of the students

**Fabiana Tiberi**

[fabiana.tiberi@uniroma3.it](mailto:fabiana.tiberi@uniroma3.it)

Università degli Studi Roma Tre, Italy

*Listening to the students' point of view proves to be a fundamental element to understanding the difficulties that prevent learning and an excellent opportunity to improving the way we teach. Understanding the reasons that generate the bottlenecks gives us a lot of information on the difficulties inherent in each discipline but also on those related to the emotional and relational dimensions of teaching. This means, first of all, recognizing the practice of dialectical comparison between teachers and students is a great value, from which one can also start to revise one's own way of teaching, to reduce the gap between the expert and students' knowledge and probably prevent school failure.*

**Keywords:** listening, relationship, flexibility, affective humanistic approach

## Introduction

Much of research has long accepted how discussion and interaction in the classroom favours not only the establishment of a positive climate but also an environment that, by stimulating constructive relationships between teacher and learner, promotes learning. In the same way we are increasingly more interested in the ways to encourage learning and now many teachers, in their classes propose methods and activities that can guarantee success to the majority of their students in their studies.

## Theoretical background

The *Decoding the Disciplines* methodology is inserted within this framework and proposes and experiments an innovative intervention protocol divided into seven steps, the first of which is the discussion aimed at identifying the bottleneck which hinders the learning of each discipline. It is from this first phase that the

methodology sets out to narrow the distance between expert thinking, with no judgment, and that of beginners, trying to remove the obstacles to learning that the students themselves are invited to identify.

The innovative proposal of the *Decoding the Disciplines* methodology consists in identifying as the focus of the guided conversation with the students the very essence of the discipline, since it has recognized a construction and its own epistemological characteristics that are often very distant and therefore difficult to understand for an untrained learner. Moreover, the student assumes a central and active role for the construction of his / her own knowledge, because it is precisely from his / her reflections that one starts the construction of the learning paths.

## Application and findings

And it is precisely this phase that saw as protagonists the students who took part in the

conference in Rome, organized and coordinated by Professor Sandra Chistolini, Decoding the Disciplines in European Institutions of Higher Education. Intercultural and Interdisciplinary Approach to Teaching and Learning, under the Erasmus + Program at the Department of Education, University of Roma Tre.

During the event, secondary school students, divided into pairs, were interviewed by a teacher /head teacher to highlight the obstacles and difficulties they had encountered in the study of different disciplines in the classroom, in the presence of an observer who, not taking part in the conversation, had the task of noting what was being shown by the participants. At the end of the discussions that took place in the various groups, the results were shared in a plenary session, during which it was possible to recount what elements had emerged as learning difficulties identified by the students.

In this contribution we will report the salient elements and the interesting observations of the students which emerged from group number 9. The difficulties identified by the students can be divided into two macro categories: intrinsic reasons related to the epistemology of the disciplines and extrinsic reasons related to the relationship and the teaching methodology.

As for the intrinsic reasons, the students primarily reported a different approach to the disciplines belonging to the scientific field from those belonging to the humanistic field. The students reported that the disciplines belonging to the scientific field turned out to be more complex as they require an intensity and a very wide concentration time; on the contrary, the disciplines of the humanistic field require a degree of concentration that can be regulated autonomously, providing for more discursive moments.

In other words, the difference comes from the fact that the humanistic disciplines propose the development of concepts whose links are less "tight". Moreover, very often scientific disciplines need only a mechanical memorization and not any real learning and this request is not

very motivating and precludes the learning of the concept hierarchically superior to the previous one.

Now we can review what was identified by students as a problematic aspect, both in the relationship with the teacher and in the methodologies adopted, which represents a cross-cutting aspect to all disciplines and can be defined as extrinsic to the discipline.

The students complained that the traditional ways of conducting the frontal lesson are not effective and, on the contrary, they were defined as boring, especially when they were being used almost exclusively. When the teacher used only transmissive methodologies the whole class did not reach a sufficient degree of disciplinary competence and this condition established a vicious circle of learning demotivation.

On the other hand, when the teacher succeeded in raising the level of competence of the whole class, a virtuous circle of motivation of learning and a natural exchange of information was created, which became topics for discussion and comparison. To support this point of view, a student reported that his teacher of Mathematics was able to create a minimum level of competence in the whole class and this motivated everyone to further study of the subject.

The student then listed a series of actions, methodologies and attitudes assumed by the teacher who activated and fostered the learning atmosphere of the whole class:

- the simplification of the language and of the specific lexicon of the discipline
- the proposal of the concrete use of the disciplinary contents. For example, the study of the break point on the Cartesian plane used to calculate the economic convenience in choosing a gym in which to enrol ("I did not think that mathematics could be useful in my life"- one of the students exclaimed)
- the teacher's ability to be authoritative and at the same time comprehensive ("Lack of authority does not motivate the study" - they added later)

- the teacher's sensitivity in seeing the individual student for their own characteristics not as an undifferentiated group
- the teacher's flexibility in finding mediations between what the students wanted and the teacher's expectations

In addition, the students reported as an element that facilitates the learning of disciplinary content, the use of maps and diagrams because they report the logical structures of linking concepts in a synthetic form and activate personal re-elaboration.

As for the group activities proposed in class by the teachers, the students had some concerns: mismatched groups or when the purpose of the work is not clear, often does not produce results. For this reason, although they recognize the effectiveness of the explanations proposed by their peers, they however prefer small study groups, conducted by the teacher.

Learning can also take place in informal situations: a student stated that they had learned the Japanese language through the use of a website that offers real interactive activities, written and oral, between language learners and native speakers. In this case the exchange between group knowledge was particularly effective.

In general, however, the students complain about the lack of effectiveness, in general, of the activities conducted at school and the need for in-depth study at home that often required additional and specific support (private lessons). At the same time, they defined "life teachers" all the teachers that, in their scholastic experience, managed to convey an interest in the discipline and to activate a real learning.

The students perceived that some teachers communicate, even non-verbally, their lack of motivation to teaching: in these cases the motivation to learning is also lost. The students argued that often the lack of motivation for teaching is due to the lack of innovation, especially methodological, adopted by teachers; in their opinion, always proposing the same contents in

the same way creates a demotivation.

The set of considerations that emerged from this group was very interesting and the bottlenecks identified by the students, although coming from different schools, were mostly coincidental and were clearly and precisely displayed.

As for the reasons that we defined as intrinsic, it can be said that the difficulties encountered in scientific disciplines, rather than in humanistic ones, represent a great educational challenge. It is precisely on this point that the experts of the various scientific sectors should concentrate, to try to understand how to overcome the difficulties reported by the students. If the topic is deepened, further details may emerge, related to the students' study habits and the degree of knowledge of the prerequisites necessary to face the introduction of new knowledge. In the absence of more details, and especially specific for each scientific discipline, one can only put forward hypotheses that should be confirmed by further study.

The students dedicated a greater space to the reasons of methodological and relational character and their analysis was detailed and, in some points, brilliant and proactive. They in fact differentiated the inefficacy of transmissive teaching style from the effectiveness of the interactive teaching one demonstrating to be able to distinguish teacher's ability to create a class atmosphere that fosters learning. This favourable class atmosphere has nothing to do with the teacher's authority that they continue to recognize as an essential element of the relationship between learner and teacher. Another element, also emerging from other groups, was that of the concrete use of disciplinary knowledge and perhaps this element can be closely linked to the intrinsic reasons of the discipline. It may also suggest possible solutions to overcoming cognitive blocks.

At various points the need to simplify the linguistic simplification of the more complex concepts emerged, which could also be interpreted as an initial learning phase to be followed by

the gradual presentation of more complex concepts and the use of a learned lexicon.

An element that was identified as determinant is what we can call the teacher's capacity for empathy: the teacher who is able to tune in to the students, to see them in their singularity and to respond to their needs that differ from each other is, not only appreciated, but also respected in the role and function they play.

The students were also sensitive to the attitudes that teachers hold not only to the class but also to the discipline of teaching: where they see the lack of passion and enthusiasm, their motivation towards study also decreases until it runs out.

## Conclusion

To conclude, from the considerations that emerged from the students, a lot of material

emerged on which to reflect that certainly involves the structure of the disciplines but also the way in which lessons are held, the class is managed and not least the passion that the teacher demonstrates towards their discipline and towards the work they do.

The students, questioned and encouraged to reflect on the nature of the disciplines, on the methodology and on the relationship with the teachers, gave us an image of their scholastic experience that was not always positive but certainly precious as it deserves serious and profound reflections on our way of teaching. Proceeding, listening to the voice of the students and the reasons for their difficulties, proves to be a very useful strategy to start a process of revision and reconstruction of knowledge, from which we can start to improve our way of teaching, building a creative synthesis between the cognitive, emotional and relational dimensions.

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# Decoding of the Disciplines in Human ecology lectures

Asta Danilevičiūtė

[asta.danileviciute@vdu.lt](mailto: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 al., 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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# Discovering nature

Ineke De Coninck

[ineke.deconinck@vives.be](mailto:ineke.deconinck@vives.be)

VIVES University of Applied Sciences, Belgium

*Students often don't grasp the fact that scientific experiments can never present a full view of the structure of nature. They think that experiments can give you a complete answer to questions like what things are made of, how they work, what they are,... The fact that a scientist cannot explain everything accurately, makes them feel uncomfortable. A scientist can increase his knowledge, but never knows everything. There are always scientific uncertainties. Living with a question mark is a very normal state of mind for a scientist.*

**Keywords:** science, nature, scientific uncertainty, scientific research, science tools

## Introduction

Students should really understand and accept this scientific uncertainty to get an idea of what modern science is about, of what scientific discoveries are and why these discoveries are measured in probabilities. They should understand why science in itself is not worthless if there is something proven false. It just means we didn't know it well enough and were (partly) on the wrong track, eager to go on a new track to find out more. To take this way of expanding knowledge, understanding things better and better, we need increasingly better tools to observe and investigate nature.

## Decoding the bottleneck

This decoding course was given to a small group of nine first- and second-year students in the teacher training programme for secondary schools. I divided them into two groups to work together. Although my students were all physics students, this decoding course concerns students of all natural sciences.

The grand and profound idea of everlasting scientific uncertainty where knowledge is always growing, is something an expert automatically learns through years of experience

and reading. I wanted my students to achieve this experienced view a lot sooner, preferably after one lesson. That is why I decided to introduce a practical exercise for this decoding lesson. I wanted the students to experience this scientific uncertainty themselves when investigating a kind of black box, never being able to know exactly what was inside. Of course, the inside of the black box was a metaphor for nature and all its aspects. Nature never ever reveals everything.

I presented the black box as a present and it was up to them to find out what the present contained. This present had several layers, each layer requiring more specialised tools to open it. The first layer was paper, easy to open by hand. The second layer was a closed wooden box, sealed with screws, so they needed a screwdriver. The third layer was a box with an aperture, where they needed pincers to remove the nails,...

With the unwrapping of each layer, more data about the inside could be found, like approximate size, approximate weight, form, magnetic or not, solid or fluid,... For each layer the student had to write down what they knew about the inside, what they guessed it contained and what they were sure of. This knowledge increased with each layer being removed.

Of course, the final layer (was it even the final one?) could not be removed. The students could make a good estimate about what was inside by listening when they shook the present and by rolling it on the table, because there were several items inside that behaved in certain ways. (In my case, it was a big plastic egg, sealed with glue. Inside the egg, there was a cardboard cube and inside that cube, there were two iron marbles. When the students rolled the egg on the table, it moved in jolts.) Crucial was the fact that they could never be sure about what was inside, they could only guess, with increasing certainty.

The students saw the analogy with scientific research, where scientific knowledge increases as the research tools get better. Similar to the unwrapping of the present, there was a powerpoint with pictures of scientific tools of growing complexity and what they revealed about nature (magnifying glass, light microscope, electron microscope, particle accelerator, even telescopes of increasing quality,...).

Having focussed on research tools, I gave a short exercise to take this a step further. I showed them two pictures about natural phenomena (a rainbow and a shooting star) and asked them to write down which questions a

small child could ask if they saw this for real. I asked them if they themselves knew the answers to these questions, which they did. Then I asked them which questions they had as physics students and if famous scientists would be able to answer them. At last, I asked if they thought these famous scientists had their own questions about these phenomena, that nobody could answer (yet). Of course, the students agreed with all this. So they realised that there will always be questions beyond the answers, always an ignorance to investigate.

### Conclusion and reflection on DD

The students clearly understood the meaning of scientific uncertainty. They were even a bit frustrated that they could not see, nor move me to tell them what was inside the present. They knew it was the same with investigating nature. Due to this decoding lesson, they saw that scientific research is a never ending story.

After the lesson they told me they thought it was a good way to talk about science and scientific research with their future students. Personally, I will keep on using this lesson for my students in physics, natural sciences and biology.

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# Teaching Maths through Decoding

Paola Supino

[psupino@uniroma3.it](mailto:psupino@uniroma3.it)

Università degli Studi Roma Tre, Italy

This is a short report about the experience of an attempt to run the Decoding Method in a class of primary school prospective teachers.

**Keywords:** Decoding, Mathematics, primary school teachers

## Introduction

When, less than three years ago, I was asked to participate in the experimental project of Decoding the Disciplines which was going to run under the framework of the European Erasmus program of Education 2016/19, my curiosity was instantaneously piqued, together with a little fear, in thinking as to what I would have to do. In fact, despite the continuous requests and evaluations in which faculty members are involved, few or no methodologies are usually handled, neither systematic training nor even reflective moments are formally dedicated to improvement of the process of teaching and learning at university level.

The Decoding methodology, which is widely used in the United States, but is a complete novelty in Italy, drives the instructors onto a path, guided by seven steps, inside which they are

left free to find their own way, that is, find their own questions and answers, to a better teaching process.

The seven steps are quite self-explanatory, nevertheless, in order to apply the methodology, a reflection and a preparation through the study of the literature is necessary.

The starting and maybe more challenging step is the search of a bottleneck: here, instructors are prompted to identify the bottlenecks that impede students to reach confidence with a specific discipline. These bottlenecks may be cognitive, emotional, methodological, epistemological. In order to be successful, the method insistently asks to carefully choose a single bottleneck at a time, and to concentrate on the specific places where students get stuck and to try to understand the nature of the problem.

Table 1. *The seven questions of the Decoding the Disciplines Model (Middendorf & Pace, 2004)*

1. What is a bottleneck to learning in this class?
2. How does an expert do these things?
3. How can these tasks be specifically modelled?
4. How will students practice these skills and get feedback?
5. What will motivate the students?
6. How well are the students mastering these learning tasks?
7. How can the resulting knowledge about learning be shared?

## The method in action

While starting to work, a great value was given to me from informal discussions with other project participants, in particular with my colleague which teaches the same group of students, being outside of mathematics education but familiar with the Decoding method.

At the stage in which my wide audience of students was, that is, a freshman course for prospective primary school teachers at University of Roma Tre, Italy, most of these was not on friendly terms with the subject, Mathematics. My main goal was not that the students could grasp this or that specific theorem, but rather become familiar with a rigorous reasoning, with the strength, the necessity and the meaning of a proof, and, more generally, become conscious of the role of creativity as equally important as reasoning in Mathematics.

Euclidean Geometry, of which students for sure have known from high school, was the running topic. I wanted to give to elementary Maths a cultural cloth, so as to avoid any mechanical training on computation, and lead students' attention to Maths' thinking.

To identify both emotional and specific bottlenecks, I submitted some written questionnaires to the students, asking their expectation from the course, their feeling on Mathematics and motivations in studying the subject. The results of the questionnaires would later serve as a guideline for developing feedback assessments along the whole course.

Not without pain, I forced myself to concentrate on some specific bottlenecks, which I choose in such a way as to be functional to my general goal. Hence, I chose to start focusing on the proof of some simple theorems of Euclidean Geometry, such as *Pythagoras* theorem, which I would teach in a couple of classes. Some unknown (for the students) generalizations of such a very well-known theorem helped me in keeping high the students' interest and motivation.

Based on my past teaching experience, on the questionnaires, and on the informal discussions with students, the very bottleneck that emerged was the automatic acceptance and memorization of the proof, without the understanding of its true logical essence and necessity.

I planned to enhance the frontal lesson with slides, in order to help students follow the mathematical reasoning without spending efforts in taking notes. In order to maintain their attention during the frontal lessons, I continuously referred to students' historical and philosophical background (supposed to be from high school) and asked them to recognize what they had learnt in the past within the new perspective I was trying to propose.

I introduced some famous pictures (The School of Athens, Raphael) and some anecdotes, such as the history of President Abraham Lincoln.

This was not enough, in fact, I was still not efficiently running the Decoding method: I had to run into Decoding steps 2 and 3. What I needed was to look at the simple, although influential *Pythagoras* theorem as the last theorem discovered in my research area, in which I was personally interested in, as a math researcher. In this way I was entering into my second Decoding step. My new mental framework made me interact with students in a different way, guiding them into the discovery of different proofs of the theorem, and disproofs of the same when looked from non-Euclidean Geometry. I asked the students to look at some simple applications of the theorem, such as measuring the distance to the horizon from an observer close to the Earth's surface. I also tried to involve attending students into actively participating in the lessons as best as I could. Since a part of them chose to sit far from the first rows and the blackboard, leaving some sad empty places, as a clear effect of a (another!) emotional bottleneck, I invited them to move closer to my desk. Some of them needed to be invited more than once. I also invited students to answer simple questions, as well as to pose themselves ques-

tions whether they had any doubts. This led me into step 5 of Decoding, and also confirmed to me that the steps do not have to be clearly linear but can be also intricate.

Since some of the students were rather passive, I decided not to explain all the proofs of the statements I had planned to present, but I invited some of them (two from the first row, two from the less attentive last row) to prepare some simple and short expositions to be presented to the class on the following lesson.

In the following lesson, one of the 4 students was absent, the three others were instead glad to do their presentation, one of them a little embarrassed, spoke very low, and the class was not paying attention to them. I then pointed out to the class the difficulty of trying to communicate and catching the interest of their peers: my aim was also to involve students into a sympathetic mood. This part had also the role of getting some feedback of my didactic action. In the meantime, I could also detect another bottleneck, that is, the difficulty of handling the math jargon with confidence and correctness, which is a crucial point also in understanding while reading a textbook. In this case my exit strategy, then frequently applied during my classes, was the use of imaginative metaphors.

In the successive courses I gave to students of the same faculty, I focused more on giving feedback, giving homework to the students on the moodle platform which I was currently using for communications and working materials. Instead of only giving a single sheet with a huge number of exercises covering all the topics of the course, I also added some shorter exercises as weekly homework, that students had to submit within a few days, so that I could mark them and give immediate feedback. Of course, due to the huge number of students in the class, I could not give back personal feed-

back to everybody, but only to some of them, that I choose randomly. This was nevertheless enough to get more attention and participation during the lessons. I have kept on with paying more attention to passages that I had not considered as being bottlenecks before, and to carefully explain symbols and Maths jargon, which trivially represent the first place in which communication between experts and students breaks down, causing a bottleneck, which starting as being only cognitive can cause an emotional one.

## Conclusion

The experience of studying and working on the Decoding method has been challenging and fruitful. Getting into the knowledge of and applying the method has led me to a deeper reflection on various aspects of the didactic action, principally on reliability, the capacity of being coherent between the intentions in teaching and the actual act of teaching, putting together scope, flexibility, group and personal needs. The main critical point that I can highlight, also after discussions with colleagues, is that the decoding method, as well as other methods, requires special care when the goal is to improve the efficacy of a teaching process in classes with huge numbers of students, and with a wide range of topics to be covered within a short time, which is quite the standard in humanities in Italian Academia.

Moreover, students that are regularly attending the classes are only a part of the whole, this can garble the feedback process, and the consequent didactic action. Finally, it is certainly not surprising but it is important to be continuously renewed that there is a common core of any goal that different disciplinary classes intend to give students, that is critical thinking, and autonomous learning skills.

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# Decoding to explore the childhood mind

**Matteo Villanova**

[matteo.villanova@uniroma3.it](mailto:matteo.villanova@uniroma3.it)

Università degli Studi Roma Tre, Italy

*For the purposes of the teachings of “Child Neuropsychiatry” and “Preventive Medicine and Forensic Psychopathology” the decoding exercise was effective because all the participants showed an increase in the interest of the basic knowledge and acquired awareness of professional skills. Through metaphors, anecdotes, narration of clinical cases, on adolescence, childhood, developmental age, knowledge of mind, emotional awareness, and emotional tools it is possible to overcome the widespread “bottlenecks” in making medical aspects understandable in the educational and pedagogical context. Continuous practice leads to strengthening the potential for an effective collaboration in order to promote group work, acceptance and support, for both students in the subjects of developmental age especially for the aspects of emotional protection, and for educational relationships within the local territory.*

**Keywords:** adolescence, childhood, developmental age, knowledge of mind, emotional tools

## Introduction

The understanding of complex transversal themes is not immediately achievable by those who have never had the opportunity to visualize behaviors and attitudes that could have a better and more effective explanation. Offering examples and providing analogies which anticipate the most recurrent points of poor understanding serve to overcome the widespread “bottlenecks” in making medical aspects understandable in the educational and pedagogical context.

## Decoding the bottleneck

The experimentation conducted on a homogeneous sample of the present student population made it possible to evaluate an increase in basic knowledge on specific areas of learning which are often difficult to achieve. Antic-

ipating the most frequent bottlenecks through an apparent loss of initial time serves to avoid subsequent dispersions and false learning. Direct observation allows to evaluate the effectiveness of the Decoding coaching both in the initial broadening of the basic knowledge and in the subsequent stratification of the more specific competences deriving from these.

During the lessons Students ask to be listened to more with regard to their educational needs. The textbooks used do not follow the lessons and there are very dispersive aspects compared to what is required in practice.

Teachers often refer to lessons which are available on the web such as “YouTube” and are produced by teachers from other schools. For those topics which are not included or covered, students refer to their classmates who receive explanations outside of school. The teachers are not asked as the students believe that they will

not receive an answer. In the classes there is a small group of students which always studies and communicates with each other throughout the school year unlike most who generally show no interest, if not for minimum return.

The hopes of using the concepts learned in the world of work are very limited and even on the part of the teachers there is not much reassurance about it. The need for greater passion is expressed in observing, analyzing, understanding and reproducing the notions shared by the class as assigned tasks.

The “bottleneck” consists in the difficulties of emotional relationship and teaching effectiveness, in the difficulty in sharing the general planning and the pleasure of knowledge. Often the training path is experienced only as a moment of acquiring nationality and not of maturation in the group and in the social relationship. In this the teachers appear distant and not present in listening to the students, in relation to the need for a gradual understanding of the contents as well as that of creating a welcoming emotional environment based on expectations of enthusiasm and hope for positive investment in the future of young people.

The Decoding approach results were particularly effective to enlarge the platform of knowledge where it is necessary to increase the awareness in the scientific context with regard to the connection between medical and pedagogical subjects. Specifically, Decoding methodology eases the comprehension of transversal issues about research on adult education, about the needs related to the Person, in addition to the Gender perspective, in relations and in the preciousness of intercultural conditions to prevent any discrimination; in safeguarding parenthood, including institutional parenthood (such as teachers, social-workers, lawyers and

all Professionals involved in the helping relationship that influence the developmental parable of childhood and adolescence as institutional roles) and in the projection of this in the young adult; in the construction of prosociality, to provide an identity-based model of development in respect of otherness and biodiversity; in supporting comprehension of emotional and sexual risk regarding trauma in the developmental age and in the adult, in assisted violence, in the diversification of Sexual Identity (Genetics, Gender, Role) and Sexual Orientation.

## Conclusion and reflection on DD

Pedagogical projects based on educational pathways through the effectiveness of Decoding prove to be of great help for work on understanding emotions. The transversal comprehension of compressed themes with an absolutely conceptual and abstract value draws great hope from the use of Decoding. Examples of this include: the concept of “Mind” in adolescence; childhood development as something different from the material and anatomical dimension of the brain; and the concept of Emotional tools in its qualitative but also quantitative nature. In fact, what is not possible to transmit effectively through purely theoretical manuals or the reductive enumeration of symptoms and criteria can be more easily anticipated often through a narrative and informative approach that could seem initially off-topic but that actually contributes and leads to a subsequent effective awareness of the knowledge to be acquired. This knowledge goes beyond the acquisition of mere competences but rather nurtures learner autonomy, freedom of thought and global awareness through its application in different contexts. In other words, understanding leads to anticipation and adaptation, problem solving and enhanced social interactions.

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# Decoding and coding in Physics

**Sante Centurioni**

[sante.centurioni@uniroma3.it](mailto:sante.centurioni@uniroma3.it)

Università degli Studi Roma Tre, Italy

*The problem of communicating a concept is present in each discipline but in the Sciences there is something more. In addition to the language we use there is also the logical structure that characterizes Science and the particular subject. In Physics there are also symbols that are sometimes important because with their correct use we, not only succeed in communicating a concept, but we can also understand what we want to say from the most intimate point of view of the subject. Sometimes those symbols contain additional information and are not just an alternative way to represent what we could say in words. The necessity to use this multi-level language is a bottleneck in encoding and decoding Physics. In this work the importance to communicate Science in a correct way is discussed so as to better understand it. Coding a physical concept through words, logical structures and symbols is a way for students to understand and therefore decode what the teacher says. The majority of the data in this paper comes from lessons in High School and University and from interviews with a sample of high school students.*

**Keywords:** Physics language, coding and Decoding Physics, symbols in Physics

## Introduction

Physics is generally considered a complex discipline. There are different reasons, one is the common idea that comes from a cultural tradition where the humanistic disciplines are considered to be much closer to mankind, to its life and therefore to its thoughts and feelings. So, they are thought to be easier than scientific disciplines. The first ones are hot disciplines, the second ones are cold disciplines. This causes a psychological departure. This idea is a consequence of an inaccurate transmission of scientific thought tied to prejudices.

Here I would like to take this idea and demonstrate that it can be corrected if we work in the right direction, in those places where we educate new generations in Science, at School and University.

In an extremely simplified block diagram,

we can say that when two people are communicating there is an emitting part and a receiving part. Both are simultaneously in the communication emitting-receiving part. We have efficient communication if and only if the language and the logical structures of that particular language are clear for both sides. In Disciplines and in particular in Science it is the same. There is a professor that emits the concepts that they want to transfer using the adequate language and a student that receives the signal that translates to understanding. The problem now is what is the best way to transfer and to understand what is being transferred. At this point we have the problem of coding and decoding the disciplines. This point is very critical because there are many components that converge and contribute to a good result. Often some typical elements of a specific discipline are mixed to psychological and social components.

In Physics, this connection is very critical, and good results depend on finding the equilibrium between these components that change according to the particular context.

## Theoretical background

The first step of my work was to interview a group of High School and University students. I already had the student's ideas by other means, but in this case, I wanted a direct answer to specific questions. The questions asked were: 1) What are the difficulties that you find in understanding Physics; 2) What are your suggestions. The answers were clear: we don't understand Physics because it is very difficult, there is too much theory and Mathematics, there is inadequate use of the laboratory, we think that to improve our understanding much more practical applications are necessary and above all to see and to touch real situations to have hands-on experience. The results of this statistical sample of students are summarized in Table 1.

Answers	%
Discipline too complex	19
Discipline too simple	1
Too many formulas	11
Not enough formulas	7
Too much Mathematics	8
Not enough Mathematics	4
Language too complex	18
Language too simplified	1
Too little laboratory	19
Too distant from concrete	12

**Table 1.** Answers of a statistical sample of 500 students from a High School and University to the question: What are the difficulties that you find in studying Physics?

These answers contain many aspects to discuss that are fundamental for an educator concerned with the coding and decoding of a concept that they want to transfer. There is a similar situation for the student that has to de-

code what the professor says, to understanding what they want to say and then eventually to be able to code that particular concept for asking questions, obtaining feedback and enhancing understanding.

For what concerns Physics the first step is the initial work of the Professor. They must think of each topic in a new way, trying to individuate the difficulties that the student could have, but not forgetting the fundamental structure of the discipline because that very structure is fundamental for the education and the formation of correct scientific thought. They have to code again what they want to say, thinking how to transfer the concept in the best way, considering above all the students' particular cultural situation, but not only.

From an overview of Table 1 we can deduce that there is confusion on the part of students as to what concerns their idea about what is the meaning of studying Physics. This idea derives from their cultural inputs that they had from school and so from the teachers. When they say "discipline too difficult" they allude to difficulties of logical structures and Mathematics and so it is very hard to study because to understand, a lot of hard work is needed around the concept. This induces the student to close their mind, an instinctive refusal. This generally leads them to think of strategies to avoid the difficulties, for example studying in mnemonic ways or thinking that being a discipline so removed from real world, it is better to study in the laboratory in practical ways. This is completely incorrect. We can understand an idea of Physics only if we are able to abstract a meaning and only in this case it has sense to work in an experimental way. The laboratory is not a simplified way to understand but an instrument to better acquire a property of Nature if we are able to use data theory. To work in the laboratory is very difficult and not easy, we have to understand a complex event in Nature by using partial and often very simple information. Partial in the sense that we generally can do a small number of measurements that have an intrinsic error, not eliminable, and by this partial idea we want to understand phe-

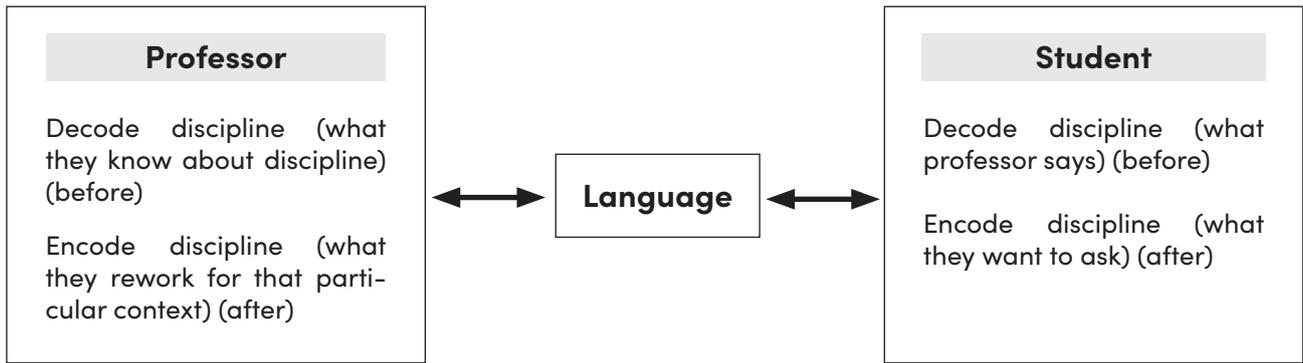


Fig. 1. This block diagram shows the very simple structure of the communication channels between Professor and Student

nomena of the World. From this picture we see that the work of a professor is very hard, and the choice of a strategy to explain a Physics concept depends on many factors and problems and for this reason it is very difficult to teach in an efficient way.

In the communication of Physics, there are many points that constitute a bottleneck. The first one is the difficulty of coding a concept in an adequate way for that particular audience towards which we are communicating. This bottleneck is caused by the need to encode multiple linguistic channels at the same time, in particular specific, terminology, logical structure of concepts, mathematical symbols. This makes the coding for the professor and the decoding for the student complex. This is very important because if we use a difficult structure of coding we do not obtain the expected results. Contrarily if the structure is too easy there is the danger that the concepts are misunderstood. These aspects are affected also by psychological and social situations, in the sense that if the student is convinced of not understanding the discipline, they will have difficulty in understanding because they will think that the discipline is not adequate to their intelligence. In addition, if they find an interest for the subject in question, they pay much more attention to the professor, who is appreciated both as a person and as an intellectual.

### Empathic-emotional aspect in Physics

There are many examples of the importance of the emotional component. I want to mention

an emblematic example about this that clearly shows this in building the educational pathway in Physics. It is interesting to speak about it because we can understand by a real event when the student loves discipline simply because something happens in the communication that “opens” their mind and touches those components of their desires, ambitions and dreams. From that moment something happens, a little lamp switches on in their mind and they find the road of their cultural life.

I want to mention a recent fact that happened summarized simply by the words that my student wrote in their Doctorate Thesis in Physics some years ago. “Dear Professor, in the fourth year of my High School, when you stopped a lesson of Thermodynamics, you said to us to look out of the window and ask ourselves if the Sun was really going down the mountains, it continuous its road or if, not seen simply vanishes. Perhaps it was not a simple joke to get back the attention of a distracted class. The fact is that some years after this thesis on the second principle of thermodynamics I understood that this was the first proof to go to see what really happens behind that mountain. In this sense, I feel I owe you a lot. Thank you for everything”.

These words explain, in a concrete way, the power of empathy. It is a great way to reach the heart of a student and for them to better understand Physics and thus better decode an idea. After all this, there is the astonishment and then the love to profoundly understand. From these bases we can built the castle of efficient communication, we can encode and code.

I think that this example of my student is important to explain this psychological and empathic aspect. Professor by his life, his is cultural ideas, is the referent point, fundamental for a student. This represents a peculiar encoding of disciplines not directly tied to the subject of discipline but which touches upon the much larger sphere of culture.

## Conclusions

This paper is only a short presentation of a very large problem present in the education of Physics. When we say Decoding the Disciplines we want to analyze this fundamental real problem. It is surely not new in the history of culture but now it has an increasingly more important role for expanding the borders of knowledge and for a complex structure of our society that places the Professor and the student in a multilayered world where cultural problems are mixed with psychological ones. Physics Education is in this situation, so it is necessary to analyze new ways to “do” education. This status creates a divergence between Professor and student. We must now find new models in coding and decoding Science. A single model does not exist, rather there are many models of communication based on the same concept of Culture. We have to adapt the education to the context. In Physics the ele-

ments that stand out are: 1) Language by words; 2) Language logical structures of discipline; 3) Symbols and Mathematics; 4) Emotional sphere (psychological, social, empathic).

Many of these elements are present in the words of the Biggest Fathers of Science, Galileo and Newton. The first one said (“La filosofia è scritta in questo grandissimo libro che ci sta aperto dinanzi agli occhi, ma non si può intendere se prima non si impara ad intendere la lingua e conoscere i caratteri ne’ quali è scritto ....senza questi è un aggirarsi vanamente per un oscuro laberinto”) Philosophy is written in this Great Book that is open in front of our eyes, but it cannot be understood if before it is not learned to understand the language and the characters in which it is written ... Without these it is the same as wandering in vain in a black labyrinth. The second one said those famous and immortal words... to myself I seem to have been like a boy playing on seashore... whilst the great ocean of truth lay all undiscovered before me. This is the spirit to teach and to learn, power and humility.

The future of Physics Education is in being able to find better and better ways of Coding and Decoding the Disciplines, in an active and continuous improvement of simple cultural and emotional framework.

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# How to see the world through Physics eyes

Ineke De Coninck

[ineke.deconinck@vives.be](mailto:ineke.deconinck@vives.be)

VIVES University of Applied Sciences, Belgium

*Students that are not really physics-minded often have difficulties explaining a natural phenomenon. They learn the laws of physics, but they don't use these laws to interpret the world around them in a natural way. They describe, but don't explain. Using the mirage or fata morgana as a concrete example in a class argument, I tried to show the students which steps they can take to explain a physical phenomenon. I wanted to give them a kind of procedure to follow. Afterwards, I gave them an exercise, where they had to explain another phenomenon of the same kind. That way I could test if this method helped the students to think for themselves.*

**Keywords:** physics, science, natural phenomena, physical laws, fata morgana

## Introduction

Students that are not really physics-minded, like the biology students in the teacher training programme who are taught some basic physics, often answer physics questions in the classroom or in exams wrongly. When I ask them to explain a natural phenomenon based on laws and knowledge on physics, they only describe what they see and look for similar phenomena, but don't explain anything. Many of these students are used to studying biology and learning things by heart, only focussing on what they see and know and what they can describe. (Also my colleague in biology is often disappointed that her students don't try to see links or logic in biology, but only describe what they see and what they learned by heart.)

Although I had been teaching this kind of students for some years, this kept on being a problem: the students could not see the world through 'physics eyes'.

## Decoding the bottleneck

Using the physical phenomenon of a fata morgana as a concrete example in a class argument, I tried to show the students which steps they could take to explain a physical phenomenon.

I gave my decoding course to a small group of eight second grade biology students in teacher training for secondary schools. Previously, these students had received a few lessons in optics about the theoretical background and the laws of physics concerning rectilinearity of light, reflection, refraction, total internal reflection,... So they knew the theory. Now they had to learn to apply this theory to natural phenomena.

A fata morgana is a strange phenomenon which every student has already seen, like a puddle of water on a hot road (Fig.1). Most students have wondered in one way or another what happens to obtain this result, because there never seems to be any real water when you come closer. Explaining a fata morgana was a good exercise, because the students needed these laws of optics they just learnt.



Fig. 1 Fata morgana on a hot road

This is where Decoding came in. I had explained the fata morgana to biology students in past years, but somehow they kept DESCRIBING HOW the light rays travelled, instead of EXPLAINING WHY, using optics laws, the light rays went this way (Fig. 2).

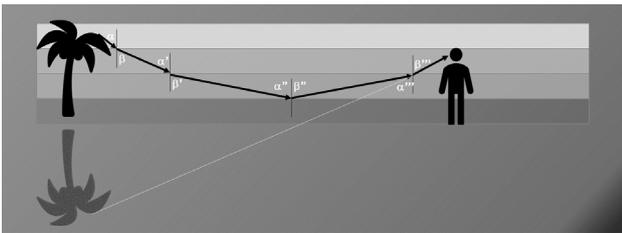


Fig. 2 Light rays in a fata morgana

I wanted to give my biology students a kind of procedure to follow to explain natural phenomena AND to make them see this difference between describing and explaining.

First I wanted them to find the explanation of the fata morgana by themselves, with me guiding them by asking (a lot of) questions. This way, they saw it was all about asking the right questions, and that the explanation itself was not that difficult, because they could find it themselves.

I started with showing them figure 1 and asked them questions like:

- What IS this?
- What is unexpected here?
- Why did you expect a wet road?
- Why do you think there must be a reflection?

- Where do you see the reflection?
- Is there something under the ground?
- Where does the light come from?
- How does it arrive in our eye?
- Which way does the light take?
- Is this normal for light?
- When does light not travel in a straight way?
- Is there reflection?
- What do you need for reflection?
- Is there refraction?
- What do you need for refraction?
- Do we have different media here?
- When can you see a fata morgana?
- What does it mean, hot and cold air?
- ...

The purpose in physics is that you are curious and want to explain things. I don't say you don't have to be curious in biology, but in physics you want to explain what is going on.

Then I started with Fig.3. Step by step, via basic questions similar to the ones above, we got to the explanation of Fig. 2.

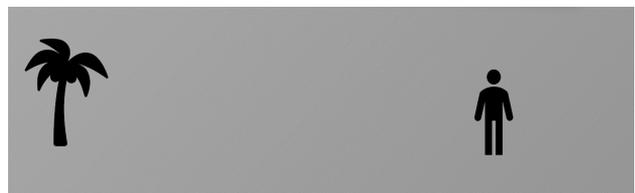


Fig. 3 Starting point for the explanation of the way the light takes

To test the result of this method, I gave the students another picture (Fig. 4), which they had to explain completely by themselves.

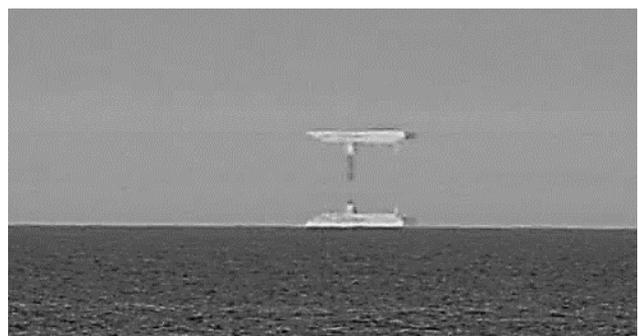


Fig. 4 Exercise on fata morgana

Year	2016-2017 (without DD)	2017-2018 (with DD)
Number of students	10	8
Average exam result	9,9/20	12,3/20
Result on exactly the same question on a different topic than fata morgana	9,6/20	15,7/20

Table 1 Exam results

This worked extremely well. The students could reason about what they saw and came to the right explanation. They were even proud to be able to do so.

I finished the DD course with a procedure the students could follow if they came to a natural phenomenon they wanted to explain:

- WHAT do I find special, strange, unexpected,...
- WHY is this special, strange, unexpected?
- At every unexpected thing you take the steps below:
  - First you look to which physics area(s) this natural phenomenon belongs. (e.g. optics)
  - Then you decide which chapter(s) it is located in (e.g. optics – reflection, mirrors/refraction/...)
  - Then you think about the the laws of physics the chapter focusses on. Is there something you can use here to explain what happens in this specific ‘unexpected thing’?

Start doing this in small steps. Later on, you can skip certain steps, because a lot of the explaining will go automatically.

## Conclusion and reflection on DD

After the lesson, some students came to me and were happy to say they finally had the feeling they were able to explain things in physics, although they were never able to do so in secondary school. They realised that a course in physics is not too difficult if you reason enough.

A few months later I compared the results of their final physics exam to the results of last year’s exam and was happy to see there was a significant improvement, although both groups of students were small (see Table 1).

I am used to teaching and getting to basics when explaining things, but I had been unaware of my skipping too many steps for this kind of students. I had a lot of help from Jolanta Mickute, who, as a non physicist, asked me the right questions when I was going too fast. She really got me to ask many more questions, even about things that looked evident to me, but apparently were not evident to my biology students. It is enriching to try to look at your own specialty as someone new to it.

I want to work in this Decoding the Disciplines way more often, with more and different examples and to teach my students, who are future teachers, to (try to) work with Decoding the Disciplines too.

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# Biographical presentation of the Authors

**Patrizia Bruno**, is a high school teacher in humanities. She teaches philosophy and human sciences at the “Benedetto Da Norcia” high school and communication & relationship techniques at the Istituto Professionale “Leonardo da Vinci” in Rome. She matured a vast experience as a recruiter and trainer in the field of human resources in national and multinational companies.

**Sandra Chistolini**, Ph.D., is a full professor in General and Social Pedagogy (Università degli Studi Roma Tre, Department of Education, Italy). Visiting scholar and professor in Universities in Europe and in USA, Japan, China, Colombia. Responsible for teacher education. Research interests include comparative studies on professional identity of teachers in Eastern and Western pedagogy, intercultural and citizenship education, theory and practice of values in school, human rights and methods of education. Partner and National Coordinator for CiCe (Children’s Identity and Citizenship in Europe) and CiCea (Children’s Identity and Citizenship European Association) Jean Monnet Erasmus + Project. Relevant publication amongst others: Chistolini, S. (2018). Decoding the Disciplines in higher education institutions. In J. Domenech, P. Merello, E. de la Poza, D. dos Blazquez (Eds.), *Congress UPV 4th International Conference on Higher Education Advances (HEAd’18)* (1019–1027). València: Editorial Universitat Politècnica de València.

**Sante Centurioni**, physicist, professor in Physics and Mathematics (Roma Tre University, Sapienza University of Rome and High school, Italy). Researcher in Astrophysics and Cosmology in cosmic background radiation, Medical Physics in magnetic resonance and Thermog-

raphy, Atmospheric Physics in stratospheric Lidar signals (CNR, National Council of Research and Wyoming University), Geomagnetism in aurora borealis (Norway) and in the mapping of the terrestrial electromagnetic field (Nagoya University). He is currently involved in researching strategies for teaching Physics from primary school to university in the analysis of mechanisms that hinder effective teaching. He works on doctoral training and teacher professional development. Author of many books and scientific articles.

**Giovanni Cogliandro**, is a member of the Legislative Office in the Cabinet of the Ministry of Education. He is invited professor at the Pontifical Urbaniana University and at the Pontifical University of Saint Thomas Aquinas. He teaches Moral Philosophy at the University of Rome Tor Vergata, Faculty of Medicine and at the Master in Management of Organisations and Social Doctrine of the Church (MODSC), Department of Management and Law. Disciplines of interest: Ethics, Jurisprudence and Political Philosophy.

**Asta Danilevičiūtė**, is the Associate professor, Senior researcher and Vice-Dean of Vytautas Magnus University, Faculty of Natural Sciences. Research interests are biomedical Sciences, environmental epidemiology, genetics and health.

**Ineke De Coninck**, is a high school teacher in Physics, Science didactics and STEM (Science Technology Engineering Mathematics) at the Teacher Training Department of VIVES University in Belgium. She is a member of the jury of Veranderwijjs (Educational Innovation King Baudouin Foundation) and a member of the Flemish Learning Network STEM. Research in-

terests are in nuclear physics, particle physics, and astronomy.

**Kristof De Craene**, is lecturer in history and diversity at the VIVES University of Applied Sciences Teacher Training Department Campus Torhout. His main interest is modern history and history didactics.

**Paola Falcioni**, is a senior professor in Geography and Human Geography. She teaches Geography and Didactics of Geography (Roma Tre University). She is a member of the Italian Association of Teachers of Geography (AllG), the Italian Geographical Society (SGI) and the Italian Centre for the Historical-geographical studies (CISGE). Research interests are in human and historical geography and history of geography. Recent publication Falcioni, P. (2016). Geography in favor of Archaeology. On the Traces of the Natural Catastrophes. In G. Capriotti Vittozzi, F. Porcelli (Eds.), *Archaeology and environment. Understanding the Past to Design the Future: A Multidisciplinary Approach. Proceedings of the International Workshop "Italian Days in Aswan", 16-18 November 2013 (55-75)*. Roma: CNR (National Council of Research).

**Luisa Ester Felicetti**, is a high school teacher of Italian language and literature and History. As a member of National and International Teacher Associations organised cultural exchanges for students and teachers. Research interests: citizenship and intercultural education, political education, school management.

**Mary Greene**, is a lecturer in human geography, NUI Galway. She specialises in the social scientific study of development and environmental change and is coordinator of the master's program - the MA 'Environment, Society and Development'. As an experienced lecturer, Mary has practice teaching, designing and implementing undergraduate and graduate programs relating to the social-scientific study of socio-environmental change. She is passionate about pedagogy and student-centred approaches to learning. Having completed postgraduate training in academic practice at the

Centre for Excellence and Learning at NUI Galway, Mary is actively committed to reflective pedagogic development. Mary has engaged with the Decoding methodology in her teaching at undergraduate and postgraduate levels, to which she has implemented problem-centred, applied and flipped classroom pedagogic activities.

**Kristina Juraitė**, is a professor at Vytautas Magnus University, Department of Public Communication. Research interests are media literacy, social communication, public space and discourse, culture of media.

**Vaida Jurgilė**, is a Ph.D. student in the field of Education, junior researcher and assistant of the Vytautas Magnus University. Her research interests are intercultural education, leadership in education, higher education, education policy and analyses, lifelong learning.

**Martina Marsano**, is a doctoral student in Theory and Educational Research and she is a member of the Research Laboratory for the Development of School and Social Inclusion at the Department of Education, Roma Tre University. Research interests are digital game-based learning, gamification in learning and school and social inclusion.

**Peter C. McKeown**, is Lecturer in Plant & AgriBiosciences at NUI Galway and Coordinator of the Masters Program in Climate Change, Agriculture and Food Security (MScCCAFS). His background is in plant science, especially genetics and epigenetics of plant reproduction and seed development, and also has interests in plant genetic resources and sustainability research. He is an editor of the *Routledge Handbook of Agricultural Biodiversity* and *Methods in Molecular Biology: Plant Epigenetics and Epigenomics* and an author on 18 peer-reviewed papers and 51 Masters Theses, mostly in co-supervision with international partner institutions such as FAO and the CGIAR (formerly the Consultative Group for International Agricultural Research) Centres'.

**Amelia Mori**, is an English expert for primary school teacher training at the Roma Tre University and assistant of English and Didactical Language. Her field of study concerns didactics and educational projects addressed to kindergarten and primary school. Her research interests include Special Educational Needs, innovative teaching methods, classroom management, methodologies for teaching English as a second language, language assessment, and language test developing. She is a test developer for the National Institute for the Schools' System Evaluation (INVALSI) and researcher in planning actions for teacher training in Italian schools.

**Diana Agnese Pallotta**, is a post-doctoral research fellow at Roma Tre University and English language lecturer at Macerata University. Over 20 years of teaching and management experience from pre-school to university and from community to work-based settings, on academic and vocational courses. Areas of interest include intercultural and citizenship education, language learning, teacher training and development.

**Stefania Petrerà**, graduated in Pedagogy and is a primary school teacher in charge of tutoring the school training of the students. She is a university teaching assistant in the field of Children's Literature (Roma Tre University) and Pedagogy (University of Rome Tor Vergata). She serves as an honorary judge at the Court of Appeals of Rome and is involved in the areas of juvenile deviancy, criminal and scholastic mediation. Her scientific interests are education and training, teachers' professional development, empirical research in education.

**Nadia Petrucci**, graduated in classical literature at La Sapienza University of Rome, specialized in Archeology, teacher of Greek and Latin in the Classical high school. She is a head teacher at the High school Istituto di Istruzione Superiore Confalonieri-De Chirico in Rome, Responsible for teacher training on skills and new technologies.

**Milena Pomponi**, is a doctoral student in Theory and Educational Research and she is a

member of the Research Laboratory for the Development of School and Social Inclusion at the Department of Education, Roma Tre University. Her research interest is developing inclusive policies in the organizational and educational processes of the education system: inclusive policies, teacher agency, community of practice, middle management, professional development.

**Paola Supino**, Ph.D. in Mathematics, assistant professor at Maths and Physics Department of the University of Roma Tre. Her fields of interests are Algebraic Geometry and teacher training. Active in international partnership, in particular with Spanish colleagues of the Universidad Autónoma de Madrid and the Universidad de Granada. She is a member of the Italian Mathematics Union.

**Giedrė Tamoliūnė**, is a young researcher and doctoral student in the field of education sciences at Vytautas Magnus University. She is a member of the European Association for Research on Learning and Instruction (EARLI) and the Lithuanian Association of Adult Education. Research interests are adult education, doctoral education and training, university teachers' professional development, empirical research in education, and open online studies.

**Fabiana Tiberi**, is a schoolteacher with teaching experience from kindergarten to secondary school. She is an expert for primary school teacher training at the Roma Tre University and assistant of Children's Literature and Italian Literature. Her field of study concerns didactics and educational projects addressed to kindergarten and primary school. Her research interests include didactic and educative management of error for foreign students and children with Special Educational Needs. She is a researcher in planning actions for teacher training in Italian schools.

**Hugo Verkest**, has a degree in education and religious studies. Lecturer at the Teacher Training College VIVES campus Torhout. Belgium. Research interests include ethics, remembrance education, history of religions and active citizenship. Supervisor in a Labo project

about media literacy supported by the Flemish Ministry of Education. Runs BA courses on school policy, remembrance education, and interactive didactic methods and study trips. He collaborates with teachers (Freinet schools) in order to incorporate historical and aesthetical topics related to museums and memorials in the classroom. Involved in modules about world citizenship, beliefs, and values for incoming Erasmus students. Facilitator-expert of the Pestalozzi Programme (Council of Europe). Publications on schoolbooks, magazines, articles, CiCe (Children's Identity and Citizenship European Association) guidelines about practice-based research. Member of a think-tank at the Ministry of Education on the new transversal target concerning citizenship education.

**Matteo Villanova**, is researcher and professor of Neuropsychiatry (Università degli Studi Roma Tre, Italy), psychoanalyst and psychotherapist of sexual and gender identity dysfunctions and disorders in adulthood and adolescence. He specialises in clinical sexology and forensic criminology. Lecturer at the Italian Center for Clinical and Experimental Hypnosis. His scientific interests are in Neurosciences, Developmental Pedagogy, Child and Adolescent Psychiatry and Rehabilitation. He is exploring the neuropsychiatric derivation of the pedagogical model in emotional education. Member of the scientific committee of ADIANTUM, Association of National Adherents for the Protection of Minors, and scientific director of the National Bullying Center.

## DECODING THE DISCIPLINES

The Decoding the Disciplines methodology was created by academics at Indiana University (IU), Bloomington, USA, aiming to implement teachers' metacognitive processes and encourage them to reflect on their practices, uncover their knowledge construction and promote learners' understanding of the disciplines. From 2016 to 2019, within the framework of Erasmus+ Programme KA201 the partner Institutions VIVES University of Applied Sciences, Kortrijk, Belgium; National University of Ireland, Galway, Ireland; Università degli Studi Roma Tre, Roma, Italy; The Ethnic Kitchen (NGO), Vilnius, Lithuania; Vytautas Magnus University, Kaunas, Lithuania led the Project *Decoding the Disciplines in European Institutions of Higher Education: Intercultural and Interdisciplinary Approach to Teaching and Learning*.

This Scholarly E-Journal presents diverse experiences, critical thinking and results of the Decoding the Disciplines application and it will serve as a great resource for higher education institutions and individuals. It provides an opportunity to approach major issues through the lens of diverse academic disciplines in the areas of Education Sciences, Humanities, Multicultural and Interdisciplinary Studies, Natural Sciences. Further documents on the application of the methodology are also available on the Open Educational Resources (OER) website <http://www.decoding.education/>.

The Editorial Team invites colleagues to re-engage in discussions on empirical research, praxis and theoretical considerations in a world characterized by multiple realities of intercultural and interdisciplinary knowledge. In this context challenges and difficult decisions are fundamental to improving our teaching and learning profession in Higher Education.

*Sandra Chistolini*, Ph.D., is a full professor in General and Social Pedagogy, Università degli Studi Roma Tre, Department of Education, Italy. Her research interests include comparative studies on professional identity of teachers in Eastern and Western pedagogy, intercultural and citizenship education, theory and practice of values in school, human rights and methods of education. Relevant publication amongst others: Chistolini, S. (2018). *Decoding the Disciplines in higher education institutions*. In J. Domenech, P. Merello, E. de la Poza, D. dos Blazquez (Eds.), *Congress UPV 4th International Conference on Higher Education Advances (HEAd'18)* (1019-1027). València: Editorial Universitat Politècnica de València.