Preface

INTRODUCTION

The educational model based on the teacher, where students usually remain passive, has its origin in the industrial society where it was necessary to train in new skills and knowledge quickly, massively and effectively. In the decade of the 60, pedagogical theories arose to promote that the students stop being passive and participate in the process of learning, rising to pedagogical models that improve the learning of students (Ausubel, 1969; Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956; Piaget, 1964).

But the educational model was not adapted to the new changes, although the industrial society gave way to the knowledge society (Välimaa & Hoffman, 2008), where technologies, cooperation, knowledge management, and adaptable products changed the ways of acting, giving place new competences, products, and services (García-Peñalvo, 2014; García-Peñalvo et al., 2017).

However, the increase in the use of the Internet has allowed access to new technologies, products, and services instantaneously and in many cases for free (Castells, 2001; García-Carrasco, 2009). This fact has considerably increased educational experiences in which students participate actively, cooperatively and participative (García-Peñalvo & Seoane-Pardo, 2015; Gros & García-Peñalvo, 2016). In these experiences, the viability, ease, and effectiveness of the active participation of students have been demonstrated (Felder & Brent, 2009; Fidalgo-Blanco, Sein-Echaluce, & García-Peñalvo, 2019; García-Peñalvo, Alarcón, & Domínguez, 2019).

Thanks to the work of scientific dissemination media, such as this book, Innovative Trends in Flipped Teaching and Adaptive Learning, these experiences are being transferred and implanted all over the world, contributing to a change in the educational model to definitively abandon the classical training centered on the teaching staff.

On the other hand, the change of the role of the students, in their vision and behavior, requires the change of the educational model, as well as the role of the teaching staff. The resources must be adapted to the students (García-Peñalvo & García Carrasco, 2003, 2005) since classically they are prepared so that the student adapts to them (Lerís & Sein-Echaluce, 2011). The massive use of face-to-face classical lectures (understood as that students have a passive attitude (Miguel Díaz, 2006)) should be reduced, as well as the rigidity of the educational program (prepared so that all students follow the same program). The new educational model requires breaking the mold of the student is the one that adapts to the program, which includes resources and rhythm of learning. In this new model, the competences, skills, and knowledge that students must acquire are fixed previously, but not the way they will be acquired. The resources, teaching methods, and programs must be fully customized and personalized (Chrysafiadi & Virvou, 2015; Clarke, 2003). This is the subject of personalized teaching and learning with the help of

technologies (Brusilovsky & Nejdl, 2008; García-Peñalvo, 2015), which help teachers to carry out actions that adapt to student learning, depending on their characteristics, skills, and knowledge (Berlanga & García-Peñalvo, 2005a, 2005b).

In the traditional and classical models, the student is the one that adapts to the teacher; this means that students adapt to the rhythm, activities, and knowledge transmitted by the faculty. In this context the students do not need to be active, it is enough to adapt themselves to the teacher.

However, in order for effective and efficient learning occurs, students must participate actively and, if possible, cooperatively (Fidalgo-Blanco, Sein-Echaluce, & García-Peñalvo, 2017; Kolb, 1984). When students have active participation in the learning process, they use superior cognitive abilities, participate in the construction of their learning, learn to learn and acquire the ability to create knowledge. In this new context, the teachers are who must adapt the model to the students. In an active learning process, each student has a rhythm and evolutionary style of learning, performs different activities and needs personalized feedback (Fidalgo-Blanco et al., 2019).

Thus, active learning and personalized learning are the two methods that act as a force of action and reaction and are capable of changing the educational model.

The current book is presented under the binomial change of the student's learning model - change of the teacher's training model. The latest innovative trend is presented to ensure that students are active, participatory and cooperative in the learning process, the Flip Teaching (Khailova, 2017) (also known as Flipped Classroom (Smallhorn, 2017)), where the spatial and temporal coincidence of the students and teachers is used to interact, participate, cooperate, and create. This method moves the classical passivity of the students in the classroom out of the classroom, while the educational resources are facilitated outside the classroom. For this reason, this method is known as the "lesson at home" and "the homework in class" (Baker, 2000).

Also, the book presents experiences and methods of carrying out adaptive teaching and learning, which are essential when students participate actively in their learning process. The experiences that are presented are applicable in the classroom easily and quickly, without the need for specialized, expensive and sophisticated technologies. Methods are introduced in which part of the training process can be adapted to the student's rhythm, to their knowledge to their profile, as we defend in the MaiN method (Fidalgo-Blanco & Sein-Echaluce, 2018; Fidalgo-Blanco, Sein-Echaluce, & García-Peñalvo, 2018a).

Concerning the target audience, this book is designed for all those people, preferably teachers and future teachers, who want to know models, technologies, application experiences and results obtained with the application of Flip Teaching and methods. Adaptive Learning, and how its interaction affects the educational model. Likewise, it allows knowing the latest research in these fields, for all scholars who investigate methods to increase the student's active participation and personalization of learning.

In the following sections, the chapters of the book are briefly described and how they are framed on both methods.

BRIEF PRESENTATION OF THE BOOK CHAPTERS

Next, a brief description of the chapters of the book is presented.

Chapter 1: Active Peer-Based Flip Teaching – An Active Methodology Based on RT-CICLO

This chapter links the active methodology with the Flip Teaching learning method. Likewise, it defines a cycle of activities that are common to any active methodology, thus establishing a relationship between the Flip Teaching method and the active methodology. The innovation model is based on the incorporation of cooperation to the activity of the "lesson at home".

Chapter 2: To Flip or Not to Flip? A Case Study on University Engineering Students

Authors use an active Flip Teaching model called Micro Flip Teaching (MFT) (Fidalgo-Blanco, Sein-Echaluce, & García-Peñalvo, 2018b; García-Peñalvo, Fidalgo-Blanco, Sein-Echaluce Lacleta, & Conde-González, 2016). It is an example where a link activity is designed to obtain data on the development of the "lesson at home" and, based on them, activities are proposed individually. The activity "duties in class" is based on solving group problems and pooling the solution.

Chapter 3: Flip and Retrofit University Lecture Theatre Into Caribbean Classrooms – Turning Teacher Education and Training Inside-Out

It is part of the impact of the method on learning and works with characteristic actions of active learning such as reflection, motivation, and involvement in the learning process by both teachers and students.

Chapter 4: Assessing the Pilot Implementation of Flipped Classroom Methodology in the Concrete and Steel Structures Subject of Architecture Undergraduate Studies

It is an experience where the innovation in Flip Teaching based on personalization is studied, through the analysis of the actions of the students during the learned lesson.

Chapter 5: Flip-Game Engineering and Technology Methodology

It is an example where the "lesson at home" of Flipped Classroom is used and for the "duties in class" the serious games are involved.

Chapter 6: The CPS Strategy – Challenges and Perspectives: A Flipped Learning Format in Foreign Language Courses

It represents a Flip Teaching model where the way to prepare the "lesson at home" is described, as well as the reaction of the students with this new activity. The usual problems are identified both by students and teachers for the realization of the "lesson at home".

Chapter 7: Digitizing Learning – How Video Games Can Be Used as Alternative Pathways to Learning

Learning by design is described as a suitable method to carry out personalized learning. The experience is based on the use of video games where each student interacts individually and differently.

Chapter 8: Adaptive Learning Using Interactive Training Material

It is proposed a method to be used outside the classroom with the purpose of leveling activities and reinforcement, promoting autonomous learning and adapting to each student's abilities, style and learning pace.

Chapter 9: Combining Adaptive and Cooperative Learning Strategies to Deal With Heterogeneity in Large Groups

Authors propose an adaptive system to the student profile. Through self-diagnosis students are grouped into different profiles, which are used to interact with each other. Heterogeneity is presented as an opportunity for different profiles in the same cooperative group.

Chapter 10: Personalized Education for a Programming Course in Higher Education

Authors use the Moodle platform and different types of scenarios. In the mixed scenario, an initial diagnosis is proposed to adapt the customized learning plan to the student's profile.

Chapter 11: Smart Learning Model Based on Competences and Activities

It deals with the design of autonomous activities with different levels of difficulty adapting to the learning style and the specific needs. It is about adapting to the profile of the students, designated from the interaction of the students with the activities.

MAPPING THE CHAPTERS WITH THE BOTH METHODS: FLIP TEACHING AND ADAPTIVE LEARNING

Below, the general characteristics of the proposed methods in this book (Flip Teaching and Adaptive Learning) are described, as well as some related works. Moreover, the chapters of this book are mapped in the description made.

Flip Teaching

One of the latest trends in educational innovation is the Flip Teaching method, also called the Flipped Classroom. This method is known as "invert" the class (Ramírez-Montoya & Ramírez-Hernández, 2016; Strayer, 2012). In the traditional model, the teacher imparts the lesson in the classroom, so that the students can later perform their homework. In this inverted model, the students first acquire the knowledge during the lesson at home and then perform the duties in the classroom.

The Flip Teaching method indicates that we must take advantage of the spatial and temporal circumstance in which the students agree to carry out active and participatory learning (Fidalgo-Blanco, Sein-Echaluce, & García-Peñalvo, 2018c). In other words, if during a class in the classroom the student is passive, an excellent opportunity to improve learning is being lost.

For this reason, the Flip Teaching is considered a method that promotes active participation, since it tries to eradicate from the classrooms both the passive attitude of the students and the expository method of the faculty (see chapter 1, chapter 3). One of the leading indicators of this active participation is that the students produce knowledge that is integrated into the teaching of the subject, along with that produced by the teachers (Fidalgo-Blanco, Sánchez-Canales, Sein-Echaluce, & García-Peñalvo, 2018).

In previously developed research on this method, there is a collective agreement on how to approach the realization of the "lesson at home" (Fidalgo-Blanco & Sein-Echaluce, 2018; Fidalgo-Blanco, Sein-Echaluce, et al., 2018a). This activity usually involves an initial effort and presents some specific problems that should be taken into account (see chapter 5). This activity is composed of a set of processes that try to offer students the same service as in a face-to-face class:

- Exhibition of the lesson (usually through short videos prepared by the teachers themselves, but they can be readings, visits to websites, examples, etc.).
- Forums so that students can raise questions that both teachers and students can answer.
- Questionnaires to check the acquisition of the knowledge exposed in the video, or on the learning process itself.

The latest advances in research are incorporating other elements, such as personalization and cooperation during the "lesson at home":

- Personalization is justified. Effectively the students visualize the video individually and could activate different activities based on their understanding of the presented concepts, and even their previous knowledge. These activities usually include questionnaires that give way to other videos or a set of interactive activities, depending on the responses of the students (see chapter 3).

- Cooperation. It is based on the realization of cooperative and on-line activities of practical activities among the students. The practical activities show a set of evidences that are then used in the face-to-face session (Fidalgo-Blanco, Martinez-Nuñez, Borrás-Gene, & Sánchez-Medina, 2017) (see chapter 1).

In order to prepare the activity of the "duties in the classroom", unlike the "lesson at home", there is no common established model. There are two lines of work in these processes:

- The lines that presuppose that the students bring the lesson learned from home and therefore in the classroom practical activities are carried out following both classical active methods, for example, problem-based learning, or newer ones such as gamification (see chapter 6).
- The lines that have generated new methods that can link and integrate with the "lesson at home". These new methods are based on analyzing the results of the questionnaires, the doubts of the forum and the evidence left by the students in online cooperative activities, to adapt the resources and activities that will be carried out in the face-to-face session. In this case, the face-to-face sessions are personalized based on what the students have done in the "lesson at home" (see chapter 2).

Thus, the personalization of learning is linked to the Flip Teaching method and is currently the most innovative line with respect to this method.

Adaptive Learning

As we have seen in the previous section, knowing the approaches, innovations, and state-of-the-art in personalized learning is key to improve and make more effective the inverted classroom method. However, personalized learning is much more than an innovative advance for the Flip Teaching method since the use of technologies allows adaptive actions and represents a key line in the educational process mainly for two reasons:

- From the origins of education, it is known that learning outcomes improve when there is personalization in training. Despite being evident, Bloom's study "2 sigma" (Bloom, 1984) showed that learning outcomes improve by 98%. Thus, the advantages of applying personalization in the training process are scientifically proven.
- It is the learning method of the future and a current concern still unresolved, as shown in the Horizon reports (Adams Becker et al., 2017). The use of Information and Communication Technologies (ICT) is making possible personalized training actions, which without them require too much effort on the part of teachers and, in many cases, are impossible to carry out (Fidalgo-Blanco, Sein-Echaluce, García-Peñalvo, & Conde-González, 2015). The ICTs help to carry out adaptive actions (the system decides) and adaptable (the students decide) to follow personalized learning itineraries (Conde-González, 2012). Even in the new training models, such as MOOCs, adaptive models are also used (García-Peñalvo, Fidalgo-Blanco, & Sein-Echaluce, 2018; Sein-Echaluce, Fidalgo-Blanco, & García-Peñalvo, 2017).

However, there exist two barriers, one historical and one technological, that limit the implementation of personalized learning.

- The cost and effort required to personalize learning in the current academic conditions is very high. The personalization process is simple: a diagnosis is made to each student, then a personalized plan is designed for each one, and finally, continuous and formative evaluation is carried out. Based on the results of this evaluation, the process is repeated. In this way each time a new design of the training plan is made, it is adapted more and more to the needs of each student. The problem is not the process, but the effort, cost and time that teachers would need to do it in a 50-student subject, for example. The solution to this barrier involves the use of technologies, and this leads directly to the second barrier, a technological one.
- The technology is based on adaptive hypermedia systems. These systems are an adaptive technology that currently, and for decades, is at the research level; it means experimental (Berlanga & García-Peñalvo, 2008), expensive, complicated to handle for non-technologist teachers because they require the re-elaboration of the educational resources.

Thus, the big problem for the application of personalized learning methods is the availability of technology and the cost of the process itself.

However, there is a research line based on the use of available tools in most academic university institutions: the eLearning systems. Indeed, the vast majority of universities have eLearning systems that are used both in online training and in-person training support, such as the most widely used open source platform worldwide such as Moodle (Lerís, Sein-Echaluce, Hernández, & Bueno, 2017; Lerís, Sein-Echaluce, Hernández, & Fidalgo-Blanco, 2016; Lerís López, Vea Muniesa, & Velamazán Gimeno, 2015). Taking Moodle as an example, the research line is based on its use as a tool to carry out personalized learning and, therefore, adapt the learning process (Conde-González, García-Peñalvo, Rodríguez-Conde, Alier, Casany, et al., 2014; Conde-González, García-Peñalvo, Rodríguez-Conde, Alier, & García-Holgado, 2014).

The use of eLearning systems or platforms does not require the re-elaboration of the contents, they are simple to manage and are consolidated tools that are easily accessible by the faculty.

The three main lines of adaptation to students to achieve the personalization of their learning are:

- *To the pace of student learning*. The same set of resources and activities is proposed for all the students, but each student can access these resources and carry out the activities at their own pace of learning. Each one will need a different period. This personalization is not only based on the rhythm of students' access to resources, but also on teacher feedback, which also adapts to that pace of learning.
- *To the knowledge of the students*. This line is usually applied in three situations:
    - Leveling of knowledge. When teachers consider it necessary for students to master a series of knowledge before tackling a specific learning activity (such as attending a session, performing exercises, preparing for an exam, etc.). In this case, the adaptation consists of making a diagnosis of the students (for example, a test) and, depending on the answers, each student will access a set of resources. The objective is that the students have a certain previous level of knowledge.

    - K-Barrier (knowledge barrier). In this case, it is not allowed to continue with the learning process until it is guaranteed that the student has carried out a particular activity. For example, if the student has not participated in a discussion forum and has not submitted a working-paper, he or she cannot continue with a specific learning activity. In this case, it is guaranteed that the students have carried out all the necessary learning activities to tackle a new activity.
    - Expansion of knowledge It is based on the possibility of students to expand knowledge once they have completed a particular activity. It can be at the request of the students (because they want to know more), it can be a decision of the faculty to reinforce specific knowledge, or it can be as preparation for a new topic.
- *To the students' profile*. In this case, different resources and activities are assigned according to the students' profile. It is usually used in adapting to students' characteristics, such as language, learning style, special needs or previous knowledge, for example, a primary or advanced activity is proposed depending on the experience in the management of a particular technology (see chapter 4, chapter 9, and chapter10).

Personalized learning usually uses the three types of adaptation in an integrated manner (see chapter 11). Given the lack of personalized learning methods, interactions with tools, not explicitly designed as adaptive, such as video games, are also being studied with the purpose of study the individual responses of each student (see chapter 8).

CONCLUSION

Educational and learning technologies, methods and tools are used in the daily development of teaching and learning processes. The most important is not the technology itself, but the students' learning outcomes. Active methodologies flipped approaches, and personalization issues are current and actual practices in all the educational levels. Teachers innovate to improve students' performance and help them achieve their goals. This book has selected a set of fascinating and outstanding practices to help the faculty to go forward in their educational practice based on or supported by technology to build up a real Knowledge Society.

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