INTERNATIONAL EXPERIENCES RELATED TO THE MODERNIZATION OF THE ACADEMIC DIDACTIC APPROACH BY MEANS OF THE FLIPPED CLASSROOM

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Abstract

Flipped classroom represents an action directive aimed at modernizing the educational approach by which the school should prepare the youth for tomorrow's great challenges. Our communication will aim at presenting the history of this idea, its characterisation, the presentation of several international experiences at the academic level and the expression of suggestions for the Romanian universities. The first experiments on this issue were made by Eric Mazur (Harvard, 1990), Jon Bergmann and Aaron Sams (2007) and Salman Khan (2004).
We shall present briefly several experiences related to the organisation of the flipped learning within the universities: Washington in Seattle, British Columbia, Michigan, Paris Descartes (Faculty of Medicine), Catholic University of Lille (Free Faculty of Sciences and Technologies), Paris-Est Marne-la-Valleé.
Flipped Learning makes an inversion of the didactic approach: the direct instruction from the traditional perspective will be done before the meeting with the teaching staff whereas the laboratories and the seminar rooms will host interactive learning activities, pointing out the group activities, with applicable and creative character. The four pillars of *Flipped Learning*: **F-** Flexible Environment; **L-** Learning Culture; Intentional Content; **P-** Professional Educators (Flipped Learning Network, 2014). We are presenting below the characteristics of organising the teaching-learning process under the shape of the flipped classroom (Jon Bergmann *et al,* 2011). We are using the contributions of the Belgian professor Marcel Lebrun (2011) with the purpose of pointing out the main force lines of the didactic approach of the flipped classroom type (Stanciu M., 2015).
The implementation of this teaching-learning strategy supposes the existence of a technological support, which involves a modernization of the academic didactic space in accordance with the real tendencies of the daily life. We have in view the existence of learning platforms for the students who attend the daily courses; the posting, on these platforms, of video sequences related to the themes of the course, to other support materials for the individual learning, to guides for the tasks that have to be done by students (individually or in a group) etc.
The implementation of this kind of approach involves, on the other hand, an ample continuous training process of the involved teaching staff. Therefore, we are also thinking of the possibility to access structural funds that should bring along the necessary logistic support and the achievement of experimental research on this issue.

Key words: flipped classroom; the Technology of Information and Communication; focus on the student; group learning.

The first experiences on the issue *Flipped Learning* were made by Eric Mazur, a Physics professor at Harvard in 1990. Mazur published in 1991 the first guide of his Physics teaching method in an interactive way (called *Peer Instruction*) (Mazur E., 1997; Dumont A., Mazur E., 2016). Jon Bergmann and Aaron Sams, two Chemistry professors at a high-school in Colorado (the USA), recorded in 2007 their courses with the help of soft and they posted them on YouTube which was watched by pupils before taking part in the educational activity. The classical classes were used for applicative activities and individualized support.

Sams consider that the paternity of this concept belongs to the British author Daniel Pink who used the phrase *Fisch flip* in an article in *Telegraph* (2010), which presented the teaching method of the Maths trainer and blogger Karl Fitsch «Lectures at night, "homework" during the day. Call it the Fisch Flip» (Pink, 2010).

The mathematician Salman Khan published his presentations on YouTube in 2004 in order to help the children study Maths more easily. About 2,400 video presentations are currently posted on the platform called Khan Academy for different fields (Maths, Sciences, Economics, Human Studies, and Computer Studies) (Khan Academy).

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The current educational system is socially built and it relies on the standardization of the education (Khan, 2013). The American studies pointed out that the educational practices in the USA remained the same in the period 1893 and 1979 (Gallagher M., Pearson P.D., 1989).

In Khan's vision, the education must be characterised by flexibility and it must consider the pace of each pupil or student. The stimulation of the creativity represents an important finality of tomorrow's school. The contents of the learning is important but it is especially important to teach pupils and students how to teach themselves (Khan, 2013).

The *Flipped Learning* represents "a simple but radical way to make the courses more appealing for all the participants" (Khan, 2013). This flipping hypostasis has in view that the lesson is taught at home and the homework is done in the classroom. Speaking strictly about universities, Khan suggested that the teaching should be done in teams of professors and even of great specialists with whom universities collaborate. Students must attend practice internships and they must be involved in making complex educational projects. While criticising the current standardised tests, Khan suggested that students should elaborate real creative portfolios during their academic studies (Khan, 2013). In conclusion, such an education must teach the young people the joy of learning and not one made by constraint.

MATERIAL AND METHOD

***Flipped Learning*- definition and general characterization**

The leaders of *Flipped Learning Network* (FLN) proposed the following definition for the *Flipped Learning* concept: "Flipped Learning is a pedagogical approach in which direct instruction moves from the group learning space to the individual learning space, and the resulting group space is transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and are involved creatively in the subject" (FLN, 2014).

The same network (FLN, 2014) suggested the four pillars of *Flipped Learning*:

F- *Flexible Environment*;
L- *Learning Culture*;
I- *Intentional Content* ;
P- *Professional Educators*.

Jon Bergmann, Jerry Overmyer and Brett Wilie (2011) pointed out the characteristics of organising the teaching-learning process under the shape of the flipped classroom:

a) It increases the interaction and the personalised contact among students and professors.

b) It creates an environment where students undertake responsibility for their own learning.

c) From *the wise man on the stage,* the professor becomes a *guide* of the efficient learning.

d) It combines the direct teaching with the constructive learning.

e) It allows the students who are absent for different reasons not to stay behind.

f) The contents of the learning may be revised at all times.

g) It helps students be involved actively in the learning process.

h) It personalizes the educational approach for all students.

"Inverting the classroom means that events which have traditionally taken place *inside* the classroom now take place *outside* the classroom and vice versa." (Lage, M.J. *et al*, 2000)

The way in which the didactic approaches are organised and carried out in the *Flipped Learning* system adds value to the contributions of great theoreticians in the learning field (Dewey, Piaget, Vygotsky, Kolb, Lewin), of the learning styles (Felder R.M., Silverman L.K., 1988) (Lebrun M., Lecoq J., 2015; Bishop J., Verleger, M., 2013).

Marcel Lebrun, a professor of informational technology at the Catholic University in Louvain-la-Neuve, the manager of the Academic Pedagogy and Multimedia Institute, the president of the International Association of Academic Pedagogy, made **a model of the flipped classroom** (Lebrun M., 2011):

a) A hybrid device

From a pedagogical point of view, a device represents a coherent group of strategies that should bring along an efficient process of teaching and learning (Lebrun, 2005). The hybridization may be considered as a mixture between the daily education and the remote one (Charlier *et al*, 2006), between the transmitted education and the one based on the individualised support (Lebrun, 2011). This definition of the device involves, in our opinion, *a systemic approach* to the following elements: finalities (objectives and competences), means (resources, instruments, methods) and evaluation (Lebrun, 2011).

b) A teaching device

The teaching can be considered as a provider of learning opportunities for students, an intentional and interactive process (Brown and Atkins, 1988).

c) A learning device

From this perspective, Marcel Lebrun (2007) identified several factors inside a pragmatic learning model.

d) Questions about the implementation of the model which are related to the factors that stimulate the learning:

- *Information*: Which will be the relevant information to stimulate the learning? May the information source be found only in the

professor's speech or may there be other sources?

- *Motivation:* Does the context convey a meaning to the learning?
- *Activities:* What instruments are at the student's disposal and generate new knowledge and transferable competences?
- *Interactions:* How will the group activity be combined with the individual one and professor's synthesis one?
- *Productions:* What will the products be? In what conditions will they be made? What are the signs of the efficient learning?

e) Concrete elements by which the device can be made

The flipped classroom may be done at three levels (Lebrun M., 2014):

a) Level I is *a hybrid model* of the performed didactic process, which combines the pupils' possibility to watch video sequences at home before actually doing that homework during the class, an approach put in theory by the American authors Jonathan Bergmann and Aaron Sams (2007).

b) Level II has in view mainly a diversification of the activities (group or individual) which may be done elsewhere, not in class: the search for information; the lecture of an article, of a chapter, of a blog; the preparations for a presentation; interviews; observations or field investigations etc. The results may be included in a platform that may have a forum for discussions. The class activities may be diversified, too: theme presentations; diverse group activities; the creation of conceptual maps.

c) Level III represents a real hybrid of the first two levels, which may be structured in four tempos: t^1 (level II at the distance); t^2 (level II by presence); t^3 (level I at the distance); t^4 (level I by presence). In this context, Marcel Lebrun suggests adding value to the theoretical model of D. Kolb (the experience learning), of I. Nonaka and H. Takeuchi (1995) (SECI: Socialization, Externalization, Combination and Internalization).

Flipped learning represents more than a strategy to modernize the teaching-learning at the level of the academic education but also a new paradigm by which the universities may respond to the multiple challenges of the 21st century, with an approach focused on the students' needs and interests, on the creation of professional and transversal competences required by the social economic and cultural dynamics of the world we live in (of post-modern essence) (*figures 1 and 2).*

RESULTS AND DISCUSSIONS

Academic experiences

We shall present briefly a few experiences related to the organisation of the *flipped learning.*

a) Washington University of Seattle

Scott Freeman aimed at improving with at least 17 % the success rate of the Biology course. He started with the observation that students could not apply critically the knowledge they acquired during the courses. The course support had been given previously and the students had to answer a test *online* before the course. In class, each student had to motivate the answer to the other student sitting nearby. The *peer instruction* technique is used here, written in theory by Eric Mazur at Harvard (The Seattle Times, 2012).
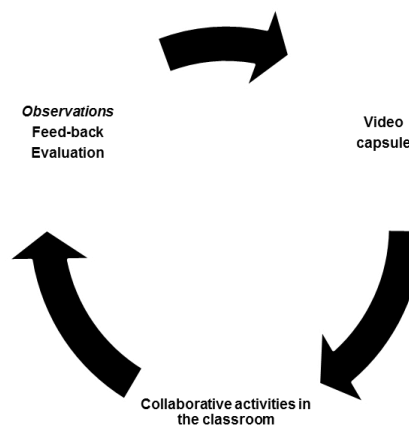

Figure 1 **The flipped classroom concept, adaptation after Marcel Lebrun (2014)**

Figure 2 **A comparative approach between the classical learning and "the flipped classroom",** Adaptation after "Une expérience de classe inversée à Paris-Est"

b) British Columbia University

At this University in Vancouver (Canada) there was an experiment related to teaching Physics to groups of 250 students/each specialisation. The course was taught in a traditional way until the last week. At that moment, two less experienced professors started to teach the *flipped* -type learning to the experimental group. The students studied the course support at home and they answered a test. In class they had learning activities in small groups and there was a personalised feedback. The students of the experimental group improved their presence by

20% and their involvement degree by 40% (Deslauriers L. *et al*, 2011).

c) Michigan University

The Maths Department of Michigan University made an experiment in which the students solved problems independently elsewhere, not during the seminar. Then they verified the solving methods in groups during the seminars. There was a test that evaluated the understanding of the used concepts (*concept inventory*-that included 22 questions) and that validated the working way (Berrett, 2012).

d) Paris Descartes University (Faculty of Medicine)

There is a licensing programme called "Frontières du Vivant" (The Frontiers of the Living), that works according to the principle of the reversed pedagogy. The students study independently at home from reference works in the field or *online* alternative sources (by video examples). Also, the platform called *Mastering Biology* includes proposed exercises and preliminary tests related to the acquired knowledge. The students are encouraged to share their opinions before the course and during the course as well as to answer the questions of their fellow students. During the laboratories, there are case analyses in groups, discussions related to the difficult aspects and evaluations of activities according to a grid. The entire course is described as an ecosystem in a permanent evolution as a consequence of the students' suggestions.

We can see the modern organisation of the laboratories and the two hours "of the course" without any stress (Cailliez J.Ch., 2014). In the first quarter of an hour a few students present the essential elements of the theme with the help of a designed scheme. The professor behaves as a real conductor of an orchestra and stimulates the students to tell their opinions and to ask questions. He does not intervene to impose his opinion, he helps them to walk on the knowledge path which has a few errors, doubts and ...small mistakes.

e) Catholic University of Lille (Free Faculty of Sciences and Technologies).

This case is about a course of *Molecular Genetics* (Cailliez J.Ch., 2013). We shall follow the presentation scheme made by the author of the blog. *The basic principle* has in view the removal of the main course in favour of an innovating and collaborative methodology. The change is major both for the student and for the professor. The student overcomes a consumer attitude and a co-constructor of the didactic approach. The professor becomes an organizer of learning situations, an animator and an orchestrator. This methodology exceeds the organization according to the flipped classroom because the students organized in groups will build the entire course. The group activity is stimulated by a competition (*serious game*).

The activity organization is made on 6 teams, each with 7-8 students. Each student will be involved with his/her team to build two chapters among the 12 ones of the courss (established by a prior protocol) and to acquire the other 10. The teams carry out their activities independently from the others but they can also interact if the exercises require it. The responsibilities are clearly delimitated within each team. The module is organised in the second semester and includes 12 meetings (laboratories), each of two hours. *The materials and the instruments* made available for the students make sure that the team work is efficient. Also, there are different integrated platforms and informational instruments (Google Groups, Google Works, Google Drive, Facebook, Padlet, Moodle, Twitter, etc.), that should allow the students to post the performed activity and that should be used by the other teams in the learning process.

The activity of the laboratory is carried out after organising the students on groups. Each meeting starts with a question addressed by the professor to all the groups. Each group is allowed 10-15 minutes to answer in a collective way whereas the answer is posted on the platform. Only one mark will be given to the answer of each group. Each group presents the construction of the chapter established beforehand according to the following algorithm: title, authors, summary, principles, definitions, paragraphs, explanations, adnoted schemes, tables, film and animations, bibliography, tests and questions. There will be organized 1-2 group activities related to the essential elements of the chapter (questions-answers, conceptual maps, explanations given by the professor etc.). At the end of the laboratory, each group will post on the platform the results of the activity on that day, even for a temporary period, which they will be able to modify during the following week.

Serious game constitutes the practical and "serious" modality to evaluate the activity of that group by all the students who took part to that laboratory/seminar. Each student can distribute 5 points by taking into account three criteria (the comprehension degree, the iconography, and the subjective appreciation), maximum two points for each criterion. Each student can modify their own votes from one laboratory to another whereas, at the end of the module, the first five ones get a bonus.

The evaluation is continuous and it has essentially in view the activity of the group. Three marking levels are conceived: interpersonal (the involvement in the activity of the own group); inter-groups (understanding the essential elements of a chapter that are presented by the established group); by the professor. In the exam session, there is an individual anonymous test of knowledge. The students can express their opinion at all times about the performed activities, including the professor's evaluation at the end of the semester.

f)University Paris-Est Marne-la-Valleé

The project called *PédagInnov* was initiated with the help of the created innovative structures (IDEA - *Initiative d'excellence en formations innovantes*). Its main objective is to be a reflection framework related to the experience of the flipped classroom (Chevalier, L., Adjedj, P.-J. and PÉDAGINNOV, 2014). The logo of IDEA suggests the major directions of the project: individualisation, diversification, evaluation and counselling (*accompagnement*). We can see a modification of the professor's roles as he becomes more a promoter of the practical issues, an animator of the debates, a counsellor (*accompagnement*) in the learning process. The first course of this university was Mechanics of the Deformable Solids and it was presented by Luc Chevalier, then, in the second year, there was a course about the deformation of the solids presented by Yun Mei Luo.

The didactic approach is carried out according to the following algorithm:

• *An introductory session* that will include: the objectives of the course; the flipped classroom concept; the aimed competences and the mixture in four-hour-sequences.

• *A four-hour meeting* will go through five stages: a) resources accompanied by evaluation questionnaires; b) the results of the questionnaire, comments; c) corrections brought to the questionnaire and the structuring of the knowledge on that day; d) applicative activities; e) the evaluation of the activity on that day. Additional exercises may be proposed for the ones who had understanding difficulties. The activities will end with an exam of brief evaluation.

• The last session is dedicated to the presentation of *a synthesis project* that starts as a role game in the preliminary study stage.

Flipped Learning and the technology of information and communication

The implementation of this teaching-learning strategy supposes the existence of a technological support, which involves a modernization of the academic didactic space in accordance with the current tendencies of the daily life.

The video capsules made with the teaching staff must meet certain qualities (Guo Ph. J. *et al*, 2014):
a) The video capsules should be at least six minutes short (the essential recommendation);
b) The presentations that are *combined with Power Point slides or with the help of an interactive flipchart* are more appealing;
c) The shooting of the film should be made in *a personalised framework.*
d) *The live given explanations* are more appealing;
e) *The main courses divided into small modules* are more engaging;
f) The language in use must be characterised by *enthusiasm;*
g) The creation of the video supports will have to consider their use. The conferences must be conceived so that they should be watched once whereas the tutorials must be thought so that they should be watched several times.

The creation of these video supports is an important activity in the preparations for this type of innovative didactic approach, for the achievement of which the professors must be helped by the experts in the field. We are making only a few bibliographic suggestions: (Bachelet R., 2013; Lebrun M. 2015).

CONCLUSIONS

Flipped Learning represents another paradigm, another philosophy about the achievement of education in the 21st century. *Flipped Learning* combines the focus of the didactic approach to the student (Jones L., 2007; Wright G.B., 2011) with the active learning, the creation of competences (professional and transversal ones), the integration of the technology of information and communication into the modernization of the academic didactic process. Certainly, there are various obstacles in this case, too: the quality of the materials elaborated by professors or their lack (Lebrun M., Lecoq J., 2015).

The implementation of this kind of approach involves, on the other hand, an ample process of continuous training of the involved teaching staff. Therefore, we are also thinking of the possibility to access structural funds that should bring along the necessary logistic support and the achievement of experimental research on this issue.

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