Τόμος 3, Μέρος Α

Πρακτικά

9ο Διεθνές Συνέδριο για την Ανοικτή & εξ Αποστάσεως Εκπαίδευση

Αθήνα, 23 – 26 Νοεμβρίου 2017

Ο Σχεδιασμός της Μάθησης

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ISBN 978-618-82258-8-6
ISBN SET 978-618-82258-5-5

Ελληνικό Ανοικτό Πανεπιστήμιο
Ελληνικό Δίκτυο Ανοικτής & εξ Αποστάσεως Εκπαίδευσης

"Flipped classroom" in primary schools: a Greek case , Ανεστραμμένη τάξη σε ελληνικό δημοτικό σχολείο

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"Flipped classroom" in primary schools: a Greek case

«Ανεστραμμένη τάξη» σε ελληνικό δημοτικό σχολείο

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Abstract

Flipped classroom is a spreading teaching "blended learning" model in which students watch at home a video with the theory of the next lesson and then in the class they are engaged in a lot of grouped-based interactive learning activities. This study examines the implementation of "flipped classroom" in a Greek primary school during the school year 2015-16. A group of 15 students 11-year old were taught 9 lessons of 3 on purpose differently selected subjects – Maths, Geography and History – with the model of "flipped classroom". The interactive videos were created and delivered by the teacher using free educational software. The innovation added was the students' participation in three video lessons, which proved successful as far as the acceptance of students is concerned. The data collected from teacher's and 2 critical friends' observation, score tests and students answer in a final survey. Regarding the results of this study, it was proved that "flipped classroom" activated all students, offered more opportunities for interaction, brought better learning outcomes of the control section that taught equity to traditional teaching and turned the learning in a more 'cheerful' and energetic process. It also contributed to a better management of teaching time, to the cultivation of critical thinking and to the development of students' creativity.

Keywords: *blended learning; flipped classroom; flipped learning; primary school*

Περίληψη

Η ανεστραμμένη τάξη είναι ένα διδακτικό μοντέλο «μικτής μάθησης» σύμφωνα με το οποίο οι μαθητές παρακολουθούν στο σπίτι τους ένα βίντεο με τη θεωρία του επόμενου μαθήματος, ενώ στην τάξη εμπλέκονται σε διάφορες ομαδοσυνεργατικές μαθησιακές δραστηριότητες. Η μελέτη αυτή εξετάζει την εφαρμογή του μοντέλου της ανεστραμμένης τάξης σε ένα ελληνικό δημοτικό σχολείο κατά τη σχολική χρονιά 2015-16. Ένα τμήμα 15 μαθητών της Ε´ τάξης διδάχθηκε 9 ενότητες τριών μαθημάτων (Μαθηματικά, Γεωγραφία και Ιστορία) με τη μέθοδο της ανεστραμμένης τάξης. Τα διαδραστικά βίντεο δημιουργήθηκαν από τον δάσκαλο της τάξης και μοιράστηκαν στους μαθητές μέσω εκπαιδευτικής ψηφιακής πλατφόρμας. Η καινοτομία της εφαρμογής ήταν η συμμετοχή μαθητών σε 3 από τα βιντεομαθήματα, η οποία και αποδείχθηκε επιτυχημένη ως προς την αποδοχή της από τους μαθητές. Τα δεδομένα της μελέτης προέρχονται από γραπτές δοκιμασίες των μαθητών, τις καταγραφές στο ημερολόγιο του δασκάλου, τις παρατηρήσεις δύο κριτικών φίλων και ένα ανώνυμο ερωτηματολόγιο στο οποίο απάντησαν οι μαθητές μετά το τέλος της εφαρμογής της μεθόδου. Τα αποτελέσματα της μελέτης δείχνουν το μοντέλο της ανεστραμμένης τάξης ενεργοποίησε όλους τους μαθητές, πρόσφερε περισσότερες

ευκαιρίες αλληλεπίδρασης, έφερε καλύτερα μαθησιακά αποτελέσματα σε σχέση με το αντίστοιχο τμήμα ελέγχου και μετέτρεψε τη μάθηση σε μια χαρούμενη και ενεργητική διαδικασία. Επίσης συνέβαλε στην καλύτερη διαχείριση του διδακτικού χρόνου μέσα στην τάξη, στην καλλιέργεια της κριτικής σκέψης και στην ανάπτυξη της δημιουργικότητας των μαθητών.

Λέξεις-κλειδιά: *μικτή μάθηση, ανεστραμμένη τάξη, ανεστραμμένη μάθηση, δημοτικό σχολείο*

1. Introduction

Nowadays students all over the world usually have a 24/7 Internet access via PC, laptop, tablet or even smartphone, while the percentage increases day by day as technology is getting easier and cheaper. More and more children learn to use a range of digital media, being interactive and creative by just playing games with others (Burnett, 2016). However, though the way that these students interact with the world has changed because of the use of technology, it seems that education is not keeping pace with this change. For the purpose of capturing the attention and engage these students in the process of learning, teachers need to adopt alternative teaching strategies and create modern learning environments (Roehl, Reddy & Shannon, 2013). One of these environments is provided by the learning approach that combines the traditional forms of learning with the use of technologies, i.e. "blended learning". Usually, blended learning is divided into two main forms: the in-class one that combines the physical presence of both student and teacher, and the distance learning one that is based on the use of the Internet (Dziuban, Hartman & Moskal, 2004).

A rapidly spreading teaching model that is associated with "blended learning" is the "flipped classroom". The term "flipped" refers to the reverse routine of the usual class. In particular, the lecture, traditionally performed by the teacher in the class, is at this case accomplished at home through video created either by the teacher himself or through the use of educational videos from the internet, while the homework, traditionally given at home, is now performed in class together with a lot of grouped-based interactive learning activities (Bergmann & Sams, 2012). The students have to watch at the video lessons before class time on their own pace. Then, in class, they can interact with each other or with their teacher and work on project-based or problem-solving activities.

Research on the "blended learning" as well as on the "flipped classroom" effects has been carried out to a great extent in recent years concerning mainly in higher education having very promising results (Tucker, 2012; Hunley, 2016; Bishop & Verleger, 2013; Gaughan, 2014), Yet researchers such as Nazarenko (2015) still wonder; is "flipped classroom" really advantageous for learning or it is only paying tribute to fashion? This sort of question, as well as the attractiveness of "flipping" our classroom in combination with the very limited research in Greek primary schools, urged us to "flip" our classroom of 11-year-old students during the lessons of Maths, History, and Geography. The aim of this study was to examine the possibility of implementing "flipped classroom" methodology at the age of 11-year-old in Greek primary school, as well as, the results of such an implementation. More specifically, the educational action research that took place, focused on the following: the subject matters in which the "flipped classroom" model would be more appropriated to be used and for how long, the needs (in equipment and time) for an effective use of the "flipped classroom" in primary school, the evaluation of the learning and social

benefits in our "flipped classroom" and, finally, the students' perceptions of the "flipped classroom".

2. Methodology

This educational action research took place at the 50th Primary School of Patras, Greece, during the school year 2015-2016. The participants were from one of the researchers' own classroom, a 5th grade class (11 years old) of 15 students, i.e. the Focus group. Another 5th grade class at the same school taught the same lessons in the traditional way, formed the Control group. More specifically, from September to December, we were engaged in teaching students of the Focus group how to work in groups and to use the Learning Management System Edmodo. From January to April, we used the "flipped classroom" model 9 times in 3 different subjects, i.e. Maths, History, and Geography so as to cover both science and social fields.

We designed 9 lesson plans transformed into the "flipped classroom" model (Μακροδήμος, 2016). 14 short videos (mainly of 5 or less than 5 min) were used: 13 created and one found online. For video recording, we used 4 times the Youtube editor, 1 time the Screencast-o-matic software for screen recording and 8 times our digital video camera. All videos were uploaded on our channel on Youtube. 3 out of 9 times, we presented the theoretical topics together with a student from our class, different one each time. This student participation is considered to be an innovation in the so far proposed "flipped classroom" model (Μακροδήμος, Παπαδάκης & Κουτσούμπα, 2017).

All videos were transferred to Edpuzzle, an educational platform made to edit and host video lessons, where we could record our voice on the video and incorporate questions in any part of the video that the students had first to answer and then to further continue. In Edpuzzle, we created a digital class where all our video lessons were hosted. The students could enter Edpuzzle and interact with the video lessons through Edmodo, a Learning Management System, in a very easy and successful way (Μακροδήμος & Παπαδάκης, 2016). All the software we used for the pre-class stage is free. Through the aforementioned process, we gained important feedback, since we could know who watched the videos, when, how many times as well as each student's answers to the videos questions.

In class, we spent some time discussing and answering questions about the content that had been delivered via video. Then, there was enough time for engaging students in interactive learning activities like problem-solving by groups, study cases, role playing, brainstorming, debates, mind maps and constructions. At the same time, the students were able to develop a presentation on a topic or interact with each other in a peer-assisted learning way, or interact with their teacher.

After class, the students were asked to answer a written test so as to measure their progress. Additionally, the same test was given to the other 5th grade class at the same school (Control group), who were taught the same lessons in the traditional way.

During research, we were keeping track of all the steps of the implementation of the "flipped classroom" including the observation of the students' behavior in class. In addition, two other teachers (used as critical friends) were called to watch the pre-class content and observe the in-class activities of two lessons, preparing a report after that.

Finally, at the end of our research, a 15-question survey as this is presented in Table 1 had been conducted to get students' feedback on "flipped classroom" model.

Question

1.How much did you like the videos you watched in Edpuzzle?

2.How easy was to use the Edpuzzle?

3.How much did the videos help you understand the lessons?

4.How much did the included questions in the videos help you understand the content of the videos?

5.How much did the in-class activities help you understand the lessons?

6.How much did the group work help you understand the lessons?

Other questions and answers:

7. What kind of videos did you enjoy the most?

Maths-   History,   Geography

8. What is the duration of video you prefer the most?

        < 3 min.   < 5min.   < 10 min.   < 15 min.

9. 'From the following kinds of video which one do you prefer the most?':

1st choise: Created by my teacher and presented by himself and a student.

2nd choise: Created by my teacher and presented by himself

3nd choise: Content from the internet supported by my teacher's voice

4th choise: Content from the internet

10. 'Which one of the following do you think that helps you the most to understand the lesson?':

- Lecture at school and homework at home
- Studying the next lesson at home and being engaged in learning activities at school
- Watching a video at home and being engaged in interactive learning activities at school

11. Would you like more video in your lessons at home

Yes   No

12. Which other subjects would you like to embody video lessons at home and interactive learning activities in class?

Science   Literature   Religion

13. How much did you enjoy the following in-class activities?

Activities	Answers (1=Not all, 5=Very much)				
	1	2	3	4	5
Constructions					
Measuring					
Creating math problems in groups					
Role playing					
Debates					
Interviews					
Study case					
Project					
Quiz game					

Table 1: The students' survey

3. Findings
3.1 Cognitive results

In order to measure the success of achieving the cognitive goals in each lesson, the two classes, i.e. the Focus group and the Control group, had to answer individually the same writing test after each lesson. The results of the assignments, as we can see in Figure 1, were far better regarding the Focus group than the Control one, in each lesson. The average score of the Focus group in all tests was 7.18/10, whilst the average score of the Control group was 5.52/10.
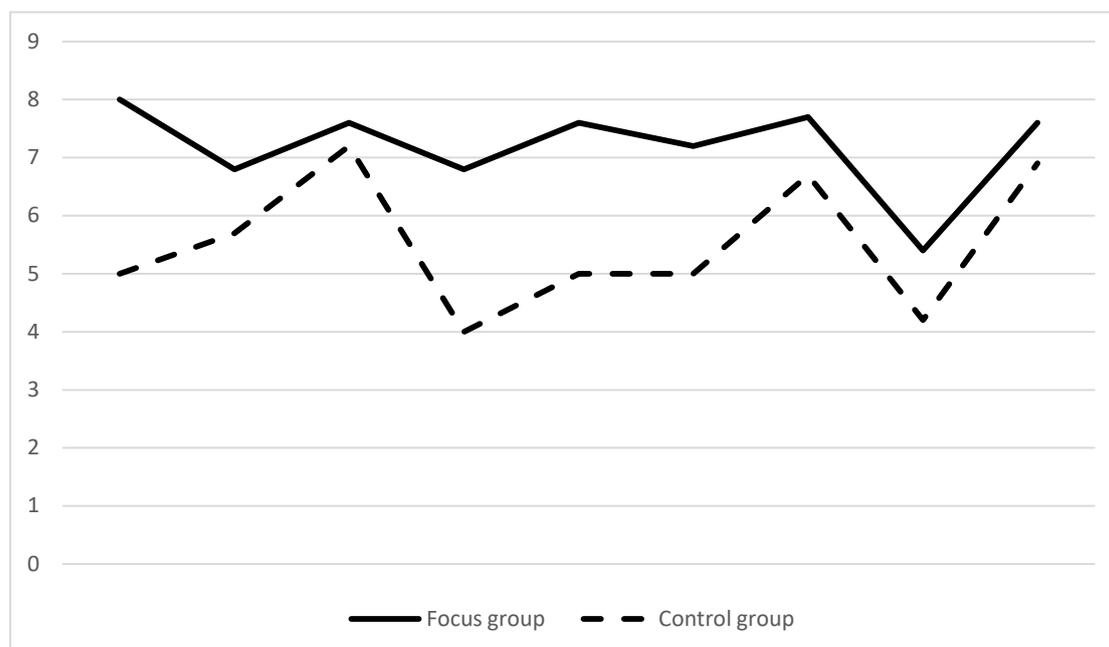

Figure 1: The results of all the assignments in classes by the Focus and the Control groups.

3.2 The results of students' survey

In the following table (Table 2), the results of the students' survey are presented:

Question	Answers (1=Not all, 5=Very much)				
	1	**2**	**3**	**4**	**5**
1.How much did you like the videos you watched in Edpuzzle?	0%	0%	13%	13%	74%
2.How easy was to use the Edpuzzle?	0%	13%	7%	33%	47%
3.How much did the videos help you understand the lessons?	0%	7%	13%	40%	40%
4.How much did the included questions in the videos help you understand the content of the videos?	0%	7%	7%	27%	59%
5.How much did the in-class activities help you understand the lessons?	0%	7%	7%	27%	59%
6.How much did the group work help you understand the lessons?	7%	7%	33%	20%	33%

Other questions and answers:

7. What kind of videos did you enjoy the most?		
Maths-21%,	History-38%,	Geography-41%

8. What is the duration of video you prefer the most?			
< 3 min.– 13%	< 5min. - 80%,	< 10 min. – 7%,	< 15 min. – 0%

In question 9, i.e. 'From the following kinds of video which one do you prefer the most?', they answered:

1st choise: Created by my teacher and presented by himself and a student.

2nd choise: Created by my teacher and presented by himself

3nd choise: Content from the internet supported by my teacher's voice

4th choise: Content from the internet

In question 10, i.e. 'Which one of the following do you think that helps you the most to understand the lesson?':

- Lecture at school and homework at home – 13%
- Studying the next lesson at home and being engaged in learning activities at school – 7%
- Watching a video at home and being engaged in interactive learning activities at school – 80%

11. Would you like more video in your lessons at home	
Yes – 93%	No – 7%

12. Which other subjects would you like to embody video lessons at home and interactive learning activities in class?		
Science – 47%	Literature – 41%	Religion – 12%

13. How much did you enjoy the following in-class activities?

Activities	Answers (1=Not all, 5=Very much)				
	1	2	3	4	5
Constructions	0%	7%	27%	20%	46%
Measuring	0%	0%	33%	27%	40%
Problem-solving in groups	0%	0%	20%	40%	40%
Creating math problems in groups	0%	0%	33%	33%	34%
Brainstorming and mind map	0%	0%	7%	40%	53%
Role playing	0%	0%	7%	0%	93%
Debates	0%	7%	20%	40%	33%
Interviews	0%	0%	7%	7%	80%
Study case	0%	7%	26%	40%	27%
Project	0%	0%	33%	27%	40%
Quiz game	0%	0%	13%	20%	67%

Table 2: *Results of the students' survey*

3.3 Critical friends' report and Teacher's field notes

The two teachers watched all the pre-class content and observed the in-class activities during two "flipped" lessons noticed:

- Increased interest and total participation in the in-class interactive activities by all students
- Better understanding of the new knowledge due to the video lessons and the interactive activities
- Team skills enhanced as demonstrated in the classroom
- Reinforcing the dialogue, facilitating the expression of opinions and socializing
- Satisfied students learning by doing

From the aforementioned, it is made clear that the comments of the two teachers that played the role of critical friends were very positive to the whole process.

What we, as teachers, have observed during the "flipped" lessons were the following:

- Almost all students watched the videos on time and answered the embedded questions correctly.
- The students were motivated in class, they were continuously asking questions and were impatient to participate in the learning activities.
- There was more free class time thus it was easier to communicate with all students and to carry out a lot of activities.
- The students really enjoyed both stages of the pre-class and the in-class.
- They loved the idea of their classmate's participation in the video lesson.

Taking in account teacher's comments, it is obvious that both teacher and students were satisfied from the implementation of the "flipped classroom" model.

4. Discussion and Conclusion

The aim of this study was to examine the possibility of implementing "flipped classroom" methodology at the age of 11-year-old in Greek primary school, as well as, the results of such an implementation. It was proved that the implementation of the "flipped classroom" methodology in a class of 11 years old students, at a Greek Primary School, is not only possible but surprisingly encouraging. In fact, we successfully implemented the new model for nine (9) hours in three (3) subject matters (Maths, Geography, History) while, according to the students' answers, the "flipped classroom" can be expanded to others subjects like Literature and Science, for the whole school year time. The students' acceptance was so high so as for them to claim that they can learn much better through the "flipped classroom" than the traditional model. Students' satisfaction with "flipped classroom" was also very high.

The equipment that is needed for the students to follow the "flipped classroom" videos is based on basic technology that student usually uses as well as internet access. The teacher needs the same kind of equipment plus a video camera or a screencasting software accompanied by a microphone to produce and deliver his or her own videos.

About the time need to be spent, from both parts, so as to deal effectively with the new model, it depends on parameters such as the number of the videos and their length, student's pace and teacher's capacity to design a lesson and produce a video. In our research, most of the videos were 5 or less than 5 minutes long, while all the students watched the videos more than once and they all answered the embedded questions. Based on that, we estimated about twice the length of the videos needed for a student to finish his/her "homework".

It is proved that the teacher's time is dramatically increased when s/he wants to produce interesting videos for the students (Aidinopoulou, 2017). We estimated that about 60 minutes time is needed to design and produce a 5-minute good quality video. Also, in the beginning, an amount of time is needed to train the students to view the videos effectively.

This research showed improvement in students' achievements. Graded assignment scores were significantly higher regarding the Focus group than the Control group. The students answered that they learned and understood better when they were taught through the "flipped classroom" model. Both the researcher and the critical friends noticed that students' engagement increased. Assisted by the in-class interactive and team based learning activities, students became able to learn by doing and, furthermore, were allowed to demonstrate knowledge construction as evidence of learning. The aforementioned findings resonate with similar studies related to "flipped classroom", active and team – based learning (Estes, Ingram & Liu,2014; Gunyou, 2015; Zainuddin & Halili, 2016; Huang & Lin, 2017) .

Increased student-student and student-teacher interaction was another advantage noticed in this research as cooperation and socialization are usually missing in a traditional lecture. According to Social Development Theory (Vygotsky, 1978), "every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level (p.57)". According to Vygotsky (1978), the human personality is linked to its creative potential and education could be designed to discover and develop this potential to its fullest in each individual. Teachers could provide good instruction by finding out where each child was in his or her development and building on the child's experiences.

The innovation of making videos together with students proved to be very successful since these videos were the most popular. Students learn more when they participate in the process of learning (Grunert, 1997). The participation of a student in an interactive educational video, playing the role of a teacher, according to the social constructivism and the peer-learning theory (Damon, 1984), leads to better learning achievements of his/her fellow students.

Other facts that came out of this research were the effective use of class time and the changed role of the teacher. S/He is no longer the presenter of information but the facilitator of knowledge, a tutor, an instructional designer. As a result, the class was centered on the students and not the teacher.

A last but not least fact that is supposed to influence teacher's attitude towards teaching in innovative way and students' learning achievements is principal leadership (Cheng, 2017). In our case the principal of the school was not only enthusiastic with the idea of "flipped classroom" but she strongly supported its implementation as well, contributed in the successful results with her positive influence.

A limitation of the research was the small number of students in both Focus and Control groups and the fact that the researcher was the same person with the class teacher. So, we suggest that more research is needed to be done across the variety of schools and classes.

5. Acknowledgements

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