

# Inverting the class or investing in the class? Flipped Classroom in teaching technology for multimedia production

Mirta Fernández\*<sup>1,2</sup>, Maria Godoy Guglielmone<sup>2</sup>, Sonia Mariño<sup>2</sup>, Walter Barrios<sup>2</sup>.

<sup>1</sup> Facultad de Artes, Diseño y Ciencias de la Cultura (FADyC)

<sup>2</sup> Facultad de Ciencias Exactas y Naturales y Agrimensura (FaCENA)  
Universidad Nacional del Nordeste (UNNE)

mirtagf@hotmail.com, mvgg2001@yahoo.com,  
simarinio@yahoo.com, waltergbarrios@yahoo.com.ar

**Abstract.** In reference to the approaches that have prevailed in education in general-and in artistic education in particular- this paper promotes the introduction of applicable methods in order to generate interest among young students and to train them through the Flipped Classroom. This is an active approach, focused on the student which derives from the premise of extending the time of an activity in order to favor critical thinking and autonomy in learning. In this regard, some of the linked learning theories are highlighted; the proposal is outlined; the didactic, curricular and technological decisions are detailed. Results of its implementation are reflected in a first year subject of the School of Arts of the Northeast National University in order to promote the teaching of a software tool in an interactive multimedia narrative realization. Finally, conclusions are drawn and synthesized in the significant impact of learning for the realization of the productions in question and underlying derivations.

**Keywords:** Flipped classroom, Ubiquitous learning, TPACK model Application, Active learning Methodologies, Flipped classroom method Evaluation.

## 1 Introduction

Recent advances in technology and ideology have opened new directions for educational research in order to eliminate spatial-temporal barriers [1]. Encouraged by the increase of materials and distributed resources in the WWW, discussion and changes in the physical classroom are being generated.

On the other hand, according to the approaches that have prevailed in education in general and in artistic education in particular, Aguirre & Giráldez [2] promote the introduction of applicable methods with the aim of generating interest among young students and train them through the flipped classroom. It consists of an active approach centered on the student and which derives from the premise of extending the time of an activity in order to favor critical thinking and autonomy in learning.

Flipped Classroom refers to a teaching approach in which traditional classroom and self-learning activities are reversed or "overturned". It is presented as a pedagogical approach which uses - in general - pre-recorded conferences or readings, and guided activities. Thus, class time is used for interactive discussion, problem solving, and other activities developed with the teacher presence [3], [4], [5].

The Flipped Classroom changes the role of the teacher from being the "wise character on the stage" to being a "guide" in the process. In [3], [6], [7] some advantages and disadvantages of the Flipped Classroom are mentioned.

Some advantages are:

- an increase in the interaction between students and teachers;
- a change about the responsibility to learn upon students;
- the student's ability to study at the right time, and as many times as necessary;
- a collection of teaching resources available at any time and place;
- collaborative work among students;
- an increase in student's participation and a change from passive listening to active learning.

And some possible disadvantages are:

- time and resources investment to develop the courses;
- the possible need for technological investment;
- the time for teachers and students to adapt themselves and to acquire the new skills in order to apply the Flipped Classroom foundations.
- required for this more active and self-directed approach to learning.

For this reason, it is stated that the key to success is that students take responsibility for their learning and that they go prepared to class. This can be seen both as an advantage and as a disadvantage.

As mentioned before, this work reflects an experience based on the advantages provided implementing the Flipped Classroom as a strategy of active learning and to recognize the different learning rhythms in a large group of students from first year of the subject Introduction to Applied Technologies to Art of the Bachelor's Degree in Combined Arts from FADYCC (School of Arts, Design and Cultural Science) which belongs to the Northeast National University<sup>1</sup> (UNNE) (Chaco).

The proposal is part of the development of a practical work, in which the main purpose is the development of a multimedia narrative through the integration of multiple resources (graphics, images in movement, sound, buttons, among others) which were deployed in partial phases such as: analysis and interpretation, and application.

The tasks were monitored through tutoring in the Virtual classroom and the experience was recorded through a questionnaire that reflected the participants' perception. Based on this, the incorporation of some improvements in the approach is projected.

---

<sup>1</sup> <http://www.unne.edu.ar/>

### 1.1 Theoretical basis and linked terminology to the Flipped Classroom

In their study Bishop & Verleger [1] explain how the Flipped or Inverted Classroom methodology represents a combination of theories of learning: based on a constructivist ideology and instruction activities derived from methods under the behavioral principles. It is possible to adhere to these principles returning to Vygotsky's theory of the Proximal Development Zone (ZPD) [8], which explains how the students' learning depends on their previous knowledge in the area and how they are articulated, explaining that they require the help of the educator to reach their full potential, as well as highlighting the importance of the interaction with their peers, a scaffolding and an appropriate feedback.

Meanwhile, their spreaders and promoters Sams and Bergmann [4] point out that it is simply to turn the traditional method in which the educational content is presented in the classroom and the practice activities are carried out at home as it is shown in **Fig. 1**. In this case students receive the “master class” at home and they do the previously thought and planned homework in the classroom.



**Fig. 2.** General mechanism flipped classroom

In 2014, The Flipped Learning Network (FLN) [9] provided a universal definition as well as four widespread pillars of which are synthesized and translated in **Fig. 2**. These are intended to provide guidance for their implementation.



**Fig. 3.** The Four Pillars of F-L-I-P [9].

Even with the numerous existing experiences, one of the main criticisms to this model is that inverting a classroom may not necessarily lead to Inverted Learning [9]. This is related to the adequate preparation and the use of technological tools in activi-

ties “outside the classroom” [10], i.e., it is required to use the class time appropriately and with the intention that the model promotes. [4], [11].

## **1.2 Evaluation of the methodology**

Following Acuña [6], Fernandez & others [7] the dimensions that can be considered to be the most accepted when assessing the effects of inverting the classroom, are:

- experiential (of the learning process),
- regarding the use of video (as a mechanism of instruction).

It is also possible to predict that the combination of new teaching technologies with interactive classroom activities may result in better learning, but it may be unsatisfactory for the students [12]. In this sense Persky [13], shares some of his findings which are linked to the resistance to change that students have, and according to his experience, although the students learn more, they do not like the course and he says that the more he used inverted learning in his classes, the more his assessment as teacher lowered. Considering that the discontent and unfavorable reaction of the students could be due to the inherent inheritance of the traditional teaching model in which the teacher is responsible for "teaching" and "transmitting" the knowledge, thus the expectation of the traditional student is to deposit in the teacher the responsibility of acquiring new learnings and knowledge [14].

## **1.3 To summarize, what is Flipped Classroom?**

The existing literature agrees that one creates an environment of inverted learning, when teachers develop or select lessons available, whenever and wherever it is convenient for the student, at home, in class, during the study room, on the bus to a game or even from a hospital bed [5]; aspects that according to Burbules [15] define ubiquity in teaching. Teachers can deliver this instruction recording and narrating presentations, creating videos of themselves teaching or selecting tutorials of reliable Internet sites. Students can see the videos or screenshots as many times as they need it, allowing them to improve their productivity in the classroom.

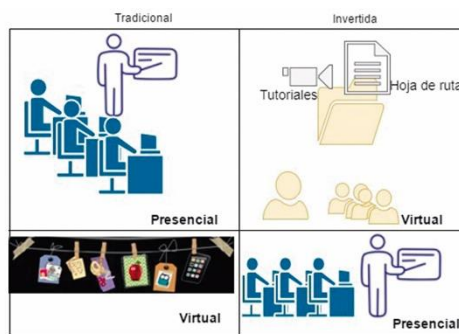
As described in this paper, the class goes from being of passive reception to one of more active participation. The teacher, by freeing himself from the class time he uses for the instruction of the students, can focus on attending to the specific needs of learning and on responding to the diversity and the different paces of learning.

## **1.4 Motivation in the selection of the method**

A hypothesis that gives rise to a paradigm shift in the classroom is the time it takes for first-year students to become familiar with some computer technologies, in which particular skills and sensitivities are put into play. An experience closely linked to such inference is presented at Algonquin College [16] in a video production class, in

which Inverted Classroom was used to teach the operation of editing software, a cumbersome procedure to explain in a conventional class.

The afore-mentioned among other factors, promotes the introduction of variations in the approach to a didactic proposal in the subject Introduction to Applied Technologies to Art, in 2016 in order to achieve a more meaningful learning taking advantage of "inverting" the classroom. As **Fig. 3** illustrates the roles and responsibilities of the participants become more proactive.

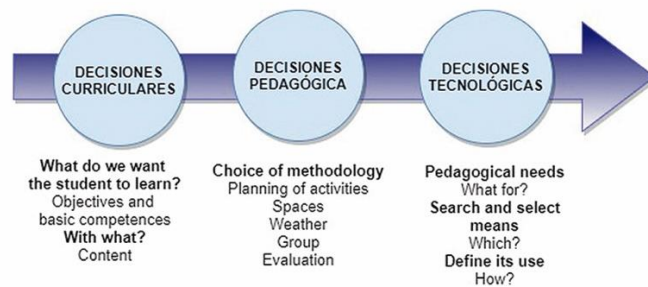


**Fig. 3.** Migration to the Flipped Classroom in the experience

The metaphor illustrates on the left the components incorporated for the traditional strategy and on the right the resources deployed to provide the necessary scaffolding to the tasks.

### 1.5 Think before innovating: use of the TPACK model in the didactic redesign

In a continuous process of decision making around the different elements of the curriculum, an alternative is to resort to the TPACK (Technological Pedagogical Content Knowledge) model [17]. The model allows emphasizing the creative-constructive dimension of the preparation and development of teaching processes, the role of the teacher as a facilitator of environments, the explicitness and discussion around these elements to integrate TIC in an effective way [18], [19]. As illustrated in Fig. 4, the orientations give rise to a series of decisions for such purposes.



**Fig. 4.** Implications in the use of ICT according to TPACK [17]

The TPACK framework, and following Harris & Hofer [20], contributed to the present work orientations for the redesign of tasks according to the activities with TIC or Learning Activity Types. Those related to the Visual Arts<sup>1</sup> from them: Build up Knowledge / Conceptualize and Apply, in the curricular context [21].

## 2 Method

In the didactic and pedagogical development for the integration of technology in teaching, the guidelines proposed by TPACK were followed. So, curricular and pedagogical decisions as well as the selection of technological resources were made. Subsequently, the results were analyzed, and the pedagogical proposal was validated in order to obtain retrospective views from the students.

## 3 Results

The subject belongs to the first year. In the curriculum, the selected theme was designed to develop exercises in the IT (information technology) classroom, using a software tool to perform an applied work.

The disparity of previous knowledge or the preparation of the students to learn in the same way was identified as the main weakness of the traditional methodology. The time it takes students to become familiar with some technologies is heterogeneous, mainly in the first University years. In addition, other factors were identified:

- students who are not familiar with technology in academic environments,
- high rate of non-attendance,
- lack of time and space for the development of customized computer classes.

Furthermore, it was admitted that students were overwhelmed with the infinity of material available on the Internet. For that reason, they formed social networks in

which they shared videos and resources to give specific answers to each group of work outside the class. The described situation influenced the teacher's activities due to the impossibility of knowing all the materials available and of giving an adequate response to the enquiries.

The above-mentioned factors contributed to the decision of rethinking the mechanisms used, so during 2016, the curricular objectives were revised, and the didactic strategy was redesigned, through guidelines that are described below.

Curricular decisions: Definition of objectives, competences and content to be addressed

The curricular decisions consisted in the definition of an integrating practical work, which allowed to reach a dual objective of the stages:

- **Analysis and interpretation:** Identify vocabulary, concepts, meanings and metaphors present in a narrative by the author Jorge Luis Borges "The Garden of Forking Paths".
- **Application:** To develop artistic representations, individually or collaboratively, using different media to develop an interactive multimedia narrative (texts, still and moving images, buttons, sound, graphics, etc.)

These objectives were defined through activities that challenge students to transfer their knowledge using a variety of resources and techniques. They also develop the competencies required in the subject that contribute to the professional profile outlined in the career.

### 3.1 Pedagogical Decisions: Planning of activities

The Flipped Classroom's planning consisted of a series of face-to-face classes in which specific guidelines were established through a roadmap. This was subsequently arranged in the virtual classroom to carry out the programmed activities:

- *Activities in classes.*

It began with a brief exposition of the study dynamics, objectives, implicit tasks, including dates of deliveries according to the partial stages of:

- Navigation map of the narrative to be treated.
- Interactive narrative in the recommended software.

Next, the text to be addressed was analyzed in a preliminary way, in order to anticipate the work outside the classroom; the remaining classes were destined to carry out group productions.

- *Post-class activity.*

These activities consisted of a set of tasks, each one consisting of at least three tutorials.

They were defined with the purpose of recognizing the work environment, carrying out individual practices, developing skills in handling the tool and advancing in the achievement of the particular objectives.

The evaluation of the work was oriented to achieve partial deliveries, in accordance with the proposed objectives and the stipulated times.

### 3.2 Technological Decisions: selection of tools and resources

Technological decisions focused on the preparation of a roadmap, the use of virtual space, the selection of tutorials and the implementation of the tool.

The objectives and tasks were projected in detail in the roadmap.

The use of the draw.io on-line tool was recommended in order to prepare the navigation map, which allows it to be edited collaboratively.

The virtual classroom was used as support for the planned activities, and materials, links and resources were available. To achieve the students' follow-up, the configuration of Groups (of students), Grouping (by tutors) and Tasks or Delivery Spaces was mainly used as shown in Fig. 5. The possibility of making partial presentations was also established and in this way the student could get to know the teacher's assessment quickly.

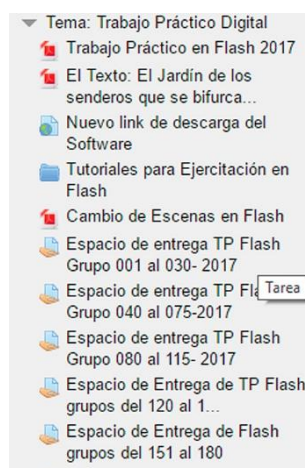


Fig. 5. Materials, task configurations and groups in the virtual classroom

Basically, the students had to exercise three tutorials available on the Web, consisting of a series of intermediate instructions. The material advantage prevails among others:

- It is an interactive website designed as a material with illustrations and the possibility of reproducing small fragments of the instructions, as shown in Fig. 6.
- Instructions can be obtained and printed in text format (.pdf).



- The first three tutorials provide scaffolding for the accomplishment of the tasks, with the possibility of extending with other tutorials and resources of the same Web site.
- The published texts and images of the designed material are created using a license<sup>2</sup> which allows them to be copied, distributed and publicly transmitted, making sure the author and the source were cited.

For the implementation of the tutorial in the selected tool, the same one as in previous courses was used (Adobe Flash CS 5). In the elaboration of the perception survey applied at the end of the study, a Google Form was set up, in order to collect the opinions, and then process them.

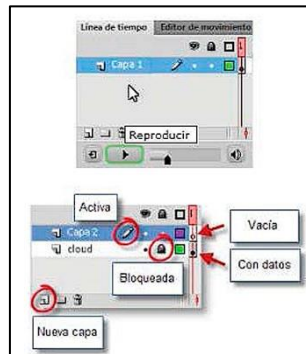


Fig. 6. Interactive Web material selected for use in Flipped Classroom<sup>3</sup>

The already mentioned advantages -among others- offered the teachers the possibility of unifying the materials destined to the students, in order to facilitate the access online or the downloads.

### 3.3 Evaluation of Flipped Classroom proposal

As regards the learning process evaluation, two dimensions were proposed: progress and students' achievements.

In the progress evaluation, the students presented difficulties of a higher level of complexity that exceeded the content of the material. For example, difficulties associated with: the use of certain sound format, the incorporation of codes or "script" applied to the interaction of buttons and scenes, or others problems of a "technical" nature.

In partial stages, a diversity of production with satisfactory results was observed.

This was linked to the abilities and interests of the students and the nature of the curriculum. Some highlights are: the recording and editing of sounds with tools dif-

<sup>2</sup> <http://creativecommons.org/licenses/by/3.0/es/legalcode.es>

<sup>3</sup> <http://mosaic.uoc.edu/FlashCS5/cast/index.html>.

ferent from the ones proposed, the introduction of a script to generate random scenes, the application of playful approaches to narrative, and others.

In relation to deadlines, the virtual classroom of the subject and the spaces allocated for such purposes, contributed to the delivery in an organized manner and on the stipulated dates.

### 3.4 Validation of the proposal. A case study in 2016

In order to validate the proposal, in 2016 an online form was prepared and implemented. The survey was applied in order to recognize the perspectives and expectations of 60 participants -chosen randomly- in relation to the methodology and tutorials used. It consisted of five (5) questions.

A scale of 1 to 4 was defined, in which one (1) represented "in disagreement", two (2) "neutral", three (3) "in agreement" and in the other extreme, four (4) "very much agreed". The results are the following:

The students were inquired about "I liked the possibility of doing a tutorial / watching a video instead of attending a traditional class (exposition) of the program's tools". As shown in Fig. 7, 75% responded between the 2 and 4 scales; while 25% responded option 1 or in "disagreement".

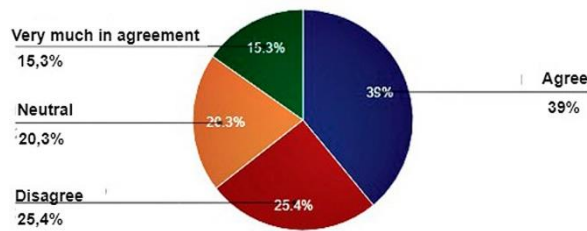


Fig. 7. Perception of the student as regards the use of video and the methodology used.

In reference to the statement "I prefer to have the traditional class (exposition) of the teacher instead of doing active and group work in classes such as those carried out", the 32.2% were "in disagreement", while the rest was concentrated in the remaining scales as shown in Fig. 8.

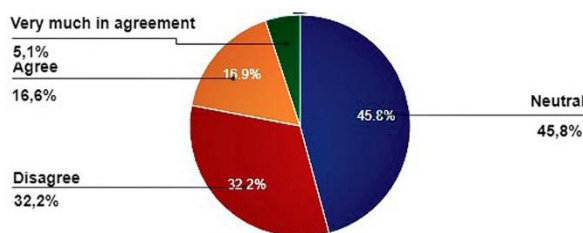
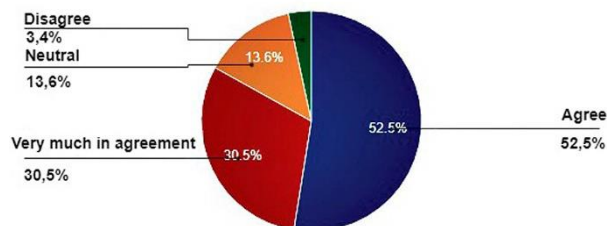


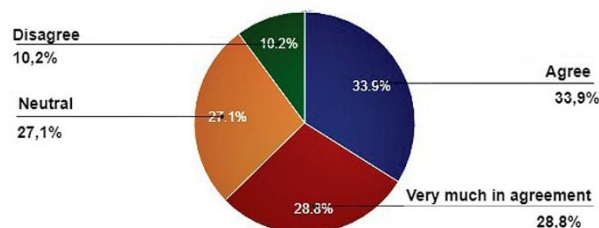
Fig. 8. The preference of traditional teaching method

Regarding the question "the use of videos allowed me to learn the study material more effectively than doing the readings alone"; more than 80% responded to options 3 and 4, as illustrated in Fig. 9. So, the students consider the material greatly facilitated their productions.



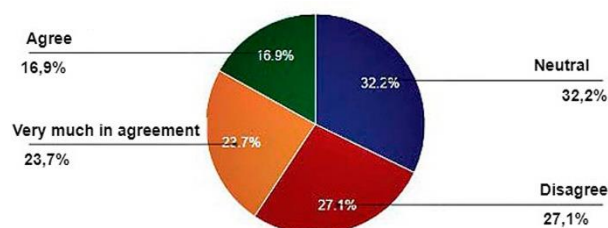
**Fig. 9.** Evaluation about the use of video.

About the question "Did I learn more when I used videos, short readings and active learning activities in class compared to the traditional method (teacher's exposition)?" Only 10.2% disagreed (**Fig. 10**).



**Fig. 10.** Level of learning obtained with the tutorials from the student's perspective

Enquiring about the teaching accompaniment (**Fig. 11**), and asking specifically about "I felt disconnected without a teacher present during videos or virtual activities", 40% answered affirmatively. So, the tutorial system must be revised and optimized.



**Fig. 11.** Evaluation of tutoring.

It was also requested to indicate (in the form) the tutor of the tasks, in order to obtain a tutoring retrospective and introduce improvements in the mechanisms designed to future courses.

## 4 Conclusions and future work

The exposed results demonstrate that it is possible to infer that the advantages of the flipped classroom as an active learning strategy have been exploited.

This paper explained the redefinition of the activities in the subject Introduction to Applied Technologies to Art in the first year of the Bachelor's Degree in combined Arts, applying the Flipped Classroom as a methodology strategy and following the Model TPACK. Thus, this paper focused on achieving the learning objectives expressed in two instances: outside the classroom to access information and didactic content and, in the classroom, to carry out productions.

The described experience was originated in 2012 as a conventional attending class activity, and in 2016 part of the proposal migrated and it was supported in the subject's virtual classroom for tutoring and access to materials.

In addition, the learning process was monitored and once it finished provided feedback data. The results showed that a significant proportion of students prefer the traditional methodology, although they recognize that they learn more, the flipped classroom promotes autonomous work and contributes to adequate management of time.

On the other hand, from the point of view of the teacher, some advantages are: the ease to develop personalized group learning, the productive use of the time in the classroom, the promotion of ubiquitous learning, the possibility of improving continuous learning and establishing a link between formal and non-formal education through Web available resources. In short, it plays a vital role in the creation of students, in the consequence of a deeper learning and in the appropriation of content, which is why the Inverted Classroom model is of interest in the teaching of technology.

The results allow to assume that the dissemination of practices focused on active learning in the university classrooms implemented since the early years is essential to achieve educational innovations. Identifying those strategies that work leads to encourage the different education protagonists in their search for new ways to improve teaching in the various scenarios which the knowledge society presents, and in response to the diversity of study rhythms.

In particular, the design of the Flipped Classroom proposal and its validation have made it possible to corroborate the initial interpellation that originated this work: the inversion of the class contributes to the investment in the class. This is supported by the fact that teachers:

- Generated new formats in order to promote the student's interaction, defining the content, the task of monitoring and evaluating accordingly.
- Facilitated experiences of autonomous access to content, critical and constructive work in attending class time.
- Contributed to research practices development, which are different from the traditional

- Followed up personal and group advances of the students in relation to the fidelity of authorship in the productions.

On the other hand, the investment in the class is illustrated by equipping students with some of the competencies required for 21st century society such as to work with accessible content in different formats, in virtual spaces and the cooperative work among others.

In 2017 a similar implementation in the systematization process was carried out, thus the analysis of both situations will provide data in order to improve the proposed design.

In addition, validating students' learning through intermediate questionnaires or online activities will be investigated in order to achieve a more effective follow-up.

## Acknowledgements

The authors are part of the Project accredited by the General Secretariat of Science and Technology by Resol. 241/17 of the Northeast National University, PI 16F019, whose title is "IT in Information Systems: Models, methods and tools". Director of the same Prof. Mariño, Sonia I. and Co-Director, Prof. Godoy Guglielmone, Maria V. The support of the Secretariat is appreciated.

## References

1. Bishop, J. L., Verleger, M. A.: The Flipped classroom: A survey of the research. In ASEE National Conference Proceedings, GA. vol. 30 (9), pp. 1-18, Atlanta (2013).
2. Jiménez, L., Aguirre, I., & Pimentel, L. G.: Educación artística, cultura y ciudadanía, OEI, Fundación Santillana. Madrid, España (2009).
3. Halili, S. H., & Zainuddin, Z.: Flipping the classroom: What we know and what. The Online Journal of Distance Education and e- Learning, vol. 3(1), 28-35 (2015).
4. Bergmann, J., & Sams, A.: Flip your classroom: Reach every student in every class every day. 1<sup>st</sup> edn. International Society for Technology in Education. United States of America (2012).
5. Hamdan, N., McKnight, P., McKnight, K., Arfstrom, K. M.: The flipped learning model: A white paper based on the literature review titled a review of flipped learning. Flipped Learning Network/Pearson/George Mason University (2013).
6. Peña, Acuña B. Vectores de la Pedagogía Docente Actual. Madrid: ACCI, España (2014).
7. Fernández Delgado A., Tabasso, E.: Humanizar la utilización de las TIC en educación. Revista de Investigación en Educación, Dykinson., 15(1), 80-82. Madrid, España (2016).
8. Vigotsky, L. S.: Interacción entre enseñanza y desarrollo, In: Colectivo de Autores del Departamento de Psicología Infantil y de la Educación. Selección de Lecturas de Psicología de las Edades I (tomo III) 25-46, La Habana (1988).
9. Flipped Learning Network (FLN): The Four Pillars of F-L-I-P (2014).
10. Domínguez, L. C., Vega, N. V., Espitia, E. L., Sanabria, Á. E., Corso, C., Serna, A.M., & Osorio, C.: Impact of the flipped classroom strategy in the learning environment in surgery: A comparison with the lectures. Biomédica 35(4), 513-521 (2015).

11. Perdomo Rodríguez, W.: Estudio de evidencias de aprendizaje significativo en un aula bajo el modelo flipped classroom. EDUTECH, Revista Electrónica de Tecnología Educativa, No. 55, 1-17 (2016).
12. Missildine K., Fountain R., Summers L., Gosselin K.: Flipping the Classroom to Improve Student Performance and Satisfaction. *The Journal of nursing education*. *J Nurs Educ*, 52(10):597–599 (2013).
13. UNMC NEWSROOM, <http://www.unmc.edu/news.cfm?match=12626>, last accessed 20/11/2017.
14. Observatorio de Innovación Educativa: Aprendizaje Invertido. *Edu Trends Reporte*. Tecnológico de Monterrey, Monterrey, México (2014).
15. Burbules, N. C.: Meanings of “ubiquitous learning”. *Education Policy Analysis Archives*, vol. 22(104):1-10 (2014).
16. Alshahrani, K., & Ally, M.: *Transforming Education in the Gulf Region: Emerging Learning Technologies and Innovative Pedagogy for the 21st Century*, Routledge Research in Education. Taylor & Francis (2016).
17. Koehler, M., & Mishra, P.: What is technological pedagogical content knowledge (TPACK)? *Contemporary issues in technology and teacher education*, 9(1), 60-70 (2009).
18. Cabero Almenara, J.: Reflexiones educativas sobre las tecnologías de la información y la comunicación (TIC). *Tecnología, Ciencia y Educación*, 1, 19-27 (2015).
19. Cabero, J.: *La formación del profesorado en TIC: modelo TPACK*, Ed. Universidad de Sevilla (2014).
20. Harris, J., Mishra, P., & Koehler, M.: Teachers’ technological pedagogical content knowledge and learning activity types: Curriculum-based technology integration reframed. *Journal of Research on Technology in Education* 41(4), 393-416 (2009).
21. Fernández, M., Barrios, W., Godoy, M., Gendin, G.: Art and ICT: Initial experiences with software tools in the training of Bachelors Degree in Combined Arts. In: *Computer Science & Technology Series. XIX Argentine Congress of Computer Science Selected Papers*, pp 121-130. Edunlp, La Plata, Argentina (2014).