



# Effects of serious games on improving learning skills and motivation in the context of flipped classrooms

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**Abstract.** Making the education system efficient and the teaching methods relevant has become a major concern. The majority of school reforms aim at improving school efficiency and fighting against failure and inequalities.

Since then, several pedagogical approaches have emerged, such as integrating new technologies into teaching methods or reversing the traditional classroom process, otherwise known as the "flipped classroom".

As its name suggests, the flipped classroom is an approach that, unlike traditional teaching, proposes to the student discover the course beforehand at home and do the homework in class.

This approach focuses on the student more than the teacher without negating the role of the teacher. It allows the student to learn at his or her own pace, views the course at his or her pace, and that his or her learning speed. It also offers the possibility of accessing the course via different forms of technological tools or not.

On the other hand, the flipped classroom method can present some significant difficulties. It requires students to be self-disciplined and motivated to follow the course without assistance. Some students may be reluctant to change.

This contribution aims to overcome these obstacles by proposing a solution whose effectiveness is no longer to be proven and which is entitled: learning through play. The student will be offered a serious game as a tool to discover and learn his lesson.

To achieve this goal, we will first provide a detailed and comparative analysis of the different works and experiments already carried out on the subject of the flipped classroom and serious games. We will also present the methodologies used and the results obtained. This will lead us to discuss their weaknesses and finally propose an educational model based on the flipped classroom structure, integrating game-based learning elements to help students be motivated and engaged. Indeed, games are a source of fun for young and old, mixing them with work, serious games will have a positive impact on learning and bring several added values.

**Keywords:** Serious Games, learning motivation, skills, learning through play, Game design, flipped classroom.

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With the evolution of technology and the emergence of tablets, smartphones, etc., this pedagogy no longer keeps pace with this change. This pedagogy no longer keeps up with the frantic pace of this change.

Indeed, high school student spends more time on social networks and video games, which can hinder the assimilation of knowledge at school, however, we cannot deny the significant benefits of games on the cognitive and social skills and the level of motivation of the student. Therefore, the current classical method is forced to adapt to the student's lifestyle by including games in its educational program. On the other hand, we cannot use just any games, they must be playful and more engaging to make learning more fun. These games are defined as serious games [1][2].

Several countries have been interested in introducing serious games into the school curriculum. Their experiments consisted in implementing serious games in the classroom as a tool for learning the course. The results have been conclusive. On the other hand, the time spent in the classroom becomes an obstacle for students with comprehension difficulties [3].

In this paper, we highlight the effects of serious games upstream of the course by following the pedagogy of flipped classes. First, we will explore flipped classrooms and SGs, their applications as well as the challenges for designers and developers of this type of learning system. Then, we will present the results of the comparisons made. Finally, we will present an educational model based on the flipped classroom structure, integrating serious games and other pedagogical approaches such as socio-constructivism, to increase students' engagement and motivation and to better monitor their progress in flipped classrooms.

## **2 Background**

### **2.1 Flipped classes.**

The flipped classroom is a teaching model that involves reversing the traditional "lesson in class, homework out".

This model was first proposed by two American teachers in 2007, Jonathan Bergmann and Aaron Sams, who began recording their lessons and publishing them online for their students to view at their own pace.

The flipped classroom, also known as the flipped classroom, is a teaching method in which students study course content at home, usually via videos, podcasts, or presentations, before coming to class. In class, students participate in hands-on activities, such as discussions, group projects, and application exercises under the supervision of the instructor [4].

According to Bissonnette and Gauthier, the flipped classroom is: « *a pedagogical approach that consists of reversing and adapting the learning activities traditionally offered to students by alternating between distance learning and classroom training to take advantage of the strengths of each.* » [5].

This innovative teaching approach allows students to work at their own pace, deepen their understanding of the course before coming to class, and become more engaged in their learning. This will allow the teacher to then focus on the individual needs of each student and provide more interactive and engaging activities in class. In addition, the flipped classroom can be customized to meet the individual needs of each student, offering a more flexible teaching approach tailored to different learning styles [6].

## 2.2 Serious Games and application

The term game refers to a physical or intellectual activity carried out for entertainment. An activity considered in most cases unproductive in the short term but which generates pleasure for the individuals who engage in it. The term serious is an indicator that is not meant for amusement. It is the character of a thing that must be taken into consideration. The combination of these two terms, which are almost opposites, produces a new perspective on games (serious games), namely, using the stimulating character of games for a didactic need while adding value.

According to "Julian ALVAREZ" a serious game (Serious Games) is a device that coherently combines serious aspects with playful springs from the game. A serious game will thus be a means to make the serious character captivating [7].

The fields of application:

Serious games are used in many public and private sectors: health, politics, defense, civic, and school education...

In the context of education, it is for example a game that includes pedagogical intentions that facilitate learning and guarantee the development and sharing of knowledge. Serious games can use digital support on computers, smartphones, virtual or augmented reality, or physical support with tangible objects [8].

Whatever the field of application, the objectives of serious games remain the same [9]:

- To convey a message
- Provide training
- Encourage learning
- Share and develop knowledge

Types of Serious Games:

In 2006, researchers Julien Alvarez and Damien Djaouti proposed five categories of games [10]:

- Advertising games: designed to promote a brand's image
- Edutainment games: dedicated to developing the user's skills

- market games: used for social, environmental, or, humanitarian awareness purposes
- Engaged games: aimed at expressing political, religious, or military protest messages
- Training and simulation games: used to reproduce real activities.

In addition, a database has been set up by the same team to classify the games and is based on the following three axes:

- Intention is the objective of the game
- The market is the context to which the game refers
- The audience is the target population

### 2.3 Related work

There are published studies that have examined the effects of introducing games into the flipped classroom on improving student learning and motivation. Some of these studies have directly compared the flipped classroom and serious games in terms of instructional effectiveness [11].

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Here are some of them [13]:

- In 2018, Béatrice Boury-Brisset and Stéphanie Netto conducted a study entitled: "The effects of serious games on learner motivation in flipped classrooms: a case study in BTS Accounting and Management."
- In 2016, Bruno Jégou studied the use of serious games in the flipped classroom for teaching history-geography.
- In 2017, Mathilde Coudray and Christine Develotte worked on the use of serious games for teaching grammar in the flipped classroom.

All of these studies had a positive impact on the motivation, engagement, and conceptual understanding of the learners who participated in the various studies.

## 3 Discussion (Proposed model)

The classic flipped classroom method is based on three steps:

Several field tests have demonstrated the benefits of introducing serial games into the educational system. The list of benefits is not exhaustive [14]:

- Step 1: Before the class, students prepare the topic by watching videos or reading articles.

- Step 2: During class, students practice key concepts with feedback. Learning is collaborative as the dedicated classroom activities are interactive and hands-on. All this takes place under the supervision of the teacher.
- Step 3: After the lesson, students check their learning and can expand their knowledge.

According to the research that was done by Abeysekera and Dawson: to succeed in this flipped classroom strategy and have a more effective method, teachers need to prepare quality teaching materials and design practical and engaging activities for students in the classroom.

The model we propose aims at improving steps 1 and 2 of the classical model. The objective is to solve problems such as:

- The technical and access difficulty related to technological resources.
- Motivation to take the course.
- To improve the student's social approach (playing in groups).

The steps of our model will be as follows:

- Step 1: Before the course, students prepare the topic using the serious game to familiarize themselves with the concepts and skills.
- Step 2: During class and with teacher supervision, students discuss their play experience, ask questions and work together to build deeper understanding.
- Step 3: After the lesson, students check their learning and can expand their knowledge.

Our model combines various educational theories that encourage active student engagement [15]:

- Socio-constructivism is a theory of learning that emphasizes the role of social interaction and the joint construction of knowledge. According to this theory, learning is an active process in which learners engage in collaborative activities to construct their understanding of the world around them.
- Game-based learning using serious games.

By integrating serious games into a socio-constructivist and flipped classroom approach, teachers can create a more engaging and interactive learning environment, providing opportunities for learners to collaborate, create and build their understanding of key concepts. This approach can also help learners develop skills such as problem-solving critical thinking, and creativity, which are important to their future success.

## 4 Conclusion

In conclusion, the use of serious games in the context of flipped classrooms can have positive effects not only on the learner but also on the teacher.

The former can see his skills and motivation improve, his learning is more fun and he is in control of his learning.

While the latter sees his role change from knowledge provider to facilitator, he can adapt his method to meet the needs of his learners, also, he will see his technological skills improve with their use.

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