

# PBL and Serious Games: the reciprocity

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## Abstract

The aim of this paper is to find out if theoretical approaches about PBL can be adapted to those of Serious Games. First this paper seeks links and similarities between the PBL and Serious Games approaches. Then it highlights their reciprocity on the pedagogic level by an experience.

## Keywords

Active learning, PBL, Serious Game, Similarity, Reciprocity, Video game.

## 1 Introduction

PBL (Problem-based learning) and Serious Game seem to have a lot in common. Thus, maybe theoretical approaches about PBL can be adapted to those of Serious Games?

To check this hypothesis, we first have to find out similarities between the active learning approach PBL and Serious Games. If a significant number of similarities is observed, then we will have to find out a reciprocity between PBL and Serious Game at a pedagogic level. Thus a pedagogic experiment have to be conceived in order to check it.

After having defined the “PBL” and “Serious Game” terms, we will find out similarities between their approaches. Then, we will define the pedagogic experiment in order to highlight the reciprocity between PBL and Serious Game. Lastly, we will present the results and conclusions.

## 2 PBL and Serious Game

### 2.1 Define PBL

According to James Rhem, PBL for "Problem-based Learning", is a subset of "active learning" pedagogic approach (p. 2)<sup>[1]</sup>.

A definition of “active learning” proposed by Meyers and Jones is: learning environments that allow “students to talk and listen, read, write, and reflect as they approach course content through problem-solving exercises, informal small groups, simulations, case studies, role playing, and other activities -- all of which require students to apply what they are learning.”(p.xi)<sup>[2]</sup>

The Faculty of Applied Science (FSA) of the catholic university of Louvain (UCL) define three principal axes of active learning<sup>1</sup>: (p.14)<sup>[3]</sup>

- *To learn starting from situation-problems*
- *To learn by itself thanks to the group*

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<sup>1</sup> Translated by the authors of this paper

- *To learn with the assistance from a tutor*

According to Rhem an official description of PBL is:

*“an instructional strategy in which students confront contextualized, ill-structured problems and strive to find meaningful solutions.”*(p.1)

According to Benoît Raucant and Cécile Vander Borgh, PBL is based on (glossary):<sup>2</sup>

- *A situation-problem come from or inspired of the professional practice (in the broad sense).*
- *A coverall of work in small groups and individual work.*
- *A systematic unfolding in several preset stages.*
- *Assistance of a tutor for certain stages of the process.*

## 2.2 Define Serious Game

In his article "From Visual Simulation to Virtual Reality to Games", Mike Zyda<sup>3</sup> proposes the following definition for Serious game: *“A mental contest, played with a computer in accordance with specific rules, that uses entertainment to further government or corporate training, education, health, public policy, and strategic communication objectives.”* (p.26)

*In other words, the vocation of Serious Game is to invite the user to interact with a data-processing application whose intention is to combine at the same time teaching, training, communication, or information aspects, with ludic mechanisms based on video game. The purpose of such an association is thus to give attractive shapes or plots (Game) to didactic contents (Serious).* (p.420)<sup>[4]</sup>

Ben Sawyer, is the co-founder and co-director of the *“Serious Games Initiative”*, located at the Woodrow Wilson Center for International Scholars in Washington D.C. which goal *“is to help usher in a new series of policy education, exploration, and management tools utilizing state of the art computer game designs, technologies, and development skills.”*<sup>4</sup>

Sawyer use to say that Serious games are made by *“developers, researchers and industrial people, who are looking at ways to use video games and video games technologies outside entertainment.”*<sup>5</sup>

## 3 To find out similarities between PBL and Serious Game

### 3.1 Why to point out similarities between PBL and Serious Game?

To find similarities would be a good way to show us that most researches and conclusions about PBL probably might be adapted to those of Serious Games. This kind of link is very important because Serious Games applications are recent. Ben Sawyer, the co-director of the *Serious Game Initiative*, has declared that the first significative serious game is *America's Army* from 2002<sup>6</sup>. So, Serious Games need pedagogic references to refer to, and may thus prove its legitimacy and its potential.

However, if such a link is discovered between PBL and Serious Game, they must also be reciprocal at the pedagogic level to prove their compatibility and resemblance. If it is verified,

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<sup>2</sup> Translated by the authors of this paper

<sup>3</sup> <http://gamepipe.usc.edu/~zyda/pubs/Zyda-IEEE-Computer-Sept2005.pdf>

<sup>4</sup> <http://www.seriousgames.org/about2.html>

<sup>5</sup> [http://seriousgames.ning.com/video/video/show?id=630751:Video:6502\(0'32 to 0'39''\)](http://seriousgames.ning.com/video/video/show?id=630751:Video:6502(0'32 to 0'39'')), May2007

<sup>6</sup> [http://www.usatoday.com/tech/gaming/2006-05-19-serious-games\\_x.htm](http://www.usatoday.com/tech/gaming/2006-05-19-serious-games_x.htm)

then we imagine that researches and conclusions about Serious Game would also contribute to the progress of PBL approach.

So, at first, let us discover how to create a Serious Game and a PBL. That will help us to find out if similarities can be identified between them.

### 3.2 How to create a Serious Game?

Zyda starts from the postulate that a video game is defined by "Story, Art and Software".

Then, he specifies:

« *Serious games have more than just story, art, and software, however. [...] they involve pedagogy: activities that educate or instruct, thereby imparting knowledge or skill. This addition makes games serious.* »

Like Zyda as well as Andre Tricot, specify that this "pedagogical scenario" should not be posed in parallel of the video game. Both must be put in coherence:

« *A human-performance engineering team works closely with the design team to oversee this pedagogy insertion.* » according to Zyda.

« *it is necessary that the two levels (pedagogical scenario and game scenario) are perfectly coherent with each other.* » according to Tricot<sup>7</sup>

To resume, to make a Serious Game, involves first to define a "pedagogical scenario" and to put it in coherence with the three aspects of the video game: "Story, Art and Software".

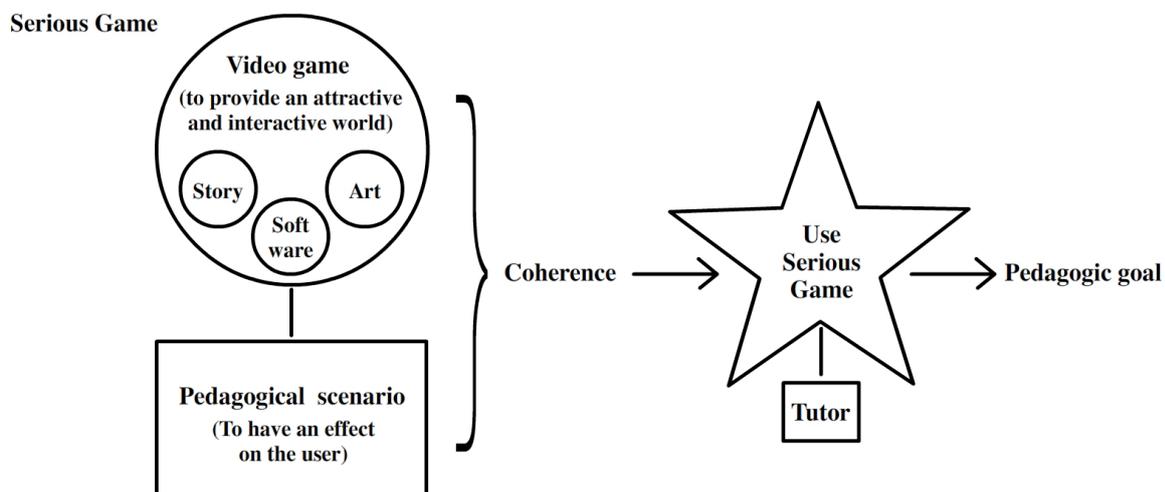


Figure 1: Serious Game design and use

### 3.3 How to create a PBL?

According to Raucant, create a PBL, is "to try to find what is the obstacle for each person or groups, as well as the adequate setting in situation. It is theatre! And the whole must generate this cognitive conflict. It is what creates the motivation. It is what creates the sense."<sup>8</sup>

In this approach, PBL integrate a "pedagogic scenario" and a "theatre" aspect. The whole of both must make it possible to generate a "cognitive conflict".

<sup>7</sup> "il faut que les deux niveaux (scenario pédagogique et scenario du jeu) soient parfaitement cohérents l'un avec l'autre.", this interview of André Tricot will be retranscribed in the thesis of J. Alvarez (planned for the beginning of 2008)

<sup>8</sup> "il faut essayer de trouver quel est l'obstacle, chez chaque personne ou groupe de personnes, ainsi que la mise en situation adéquate. C'est du théâtre ! Et le tout doit générer ce conflit cognitif. C'est ce qui crée la motivation. C'est ce qui crée le sens.", this interview of Benoît Raucant will be retranscribed in the thesis of J. Alvarez (planned for the beginning of 2008)

This notion of “*theatre*” is confirmed by the definition of Meyers and Jones who imply: “*simulations, case studies, role playing, and other activities*”. These elements are some ingredients of theatre. We notice that “*theatre*” aspect involve of course the “*Story*” and “*Art*” aspects.

Now, concerning the “*cognitive conflict*”, the official description of PBL mentioned by Rhem, also implies it: “*an instructional strategy*”. This one implies subordination to a pedagogic objective. That underlies a “*pedagogical scenario*”.

To resume, to make a PBL, involve to define a “*pedagogical scenario*” and to put it in coherence with the two aspects of a “*cognitive conflict*” (*theatre*): “*Story and Art*”.

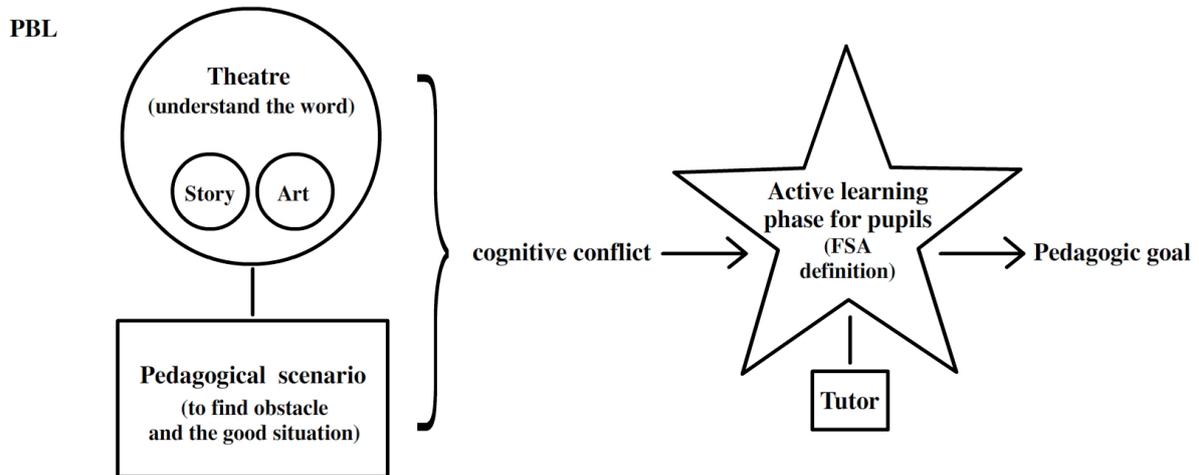


Figure 2: PBL design and use

### 3.4 PBL and Serious Game: a theatrical relation

If we compare the way to make a Serious Game and those to make a PBL (cf. Fig.1 & 2), we can observe that the processes are very closed. Serious Game adds only a “Software” aspect.

Besides, works of Frasca have established links between videogames and a category of theatre, called: the “*theatre of the oppressed*”:

“[...] videogames have the potential not only to represent reality, but also to model it through simulations. [...] For doing this, I have based my designs on the main characteristics of Augusto Boal’s *Theatre of the Oppressed*.” (p.113)<sup>[5]</sup>

We can notice the term “*simulation*” that we have already seen in the definition of Meyers and Jones. The approach of Frasca to use the Theatre of the Oppressed is confirmed by the writings of Sean Hammond, Helen Pain and Tim J. Smith :

“This review argues that the form of player agency in interactive narrative improves, with respect to the motivation of constructivist learning, as we move from Aristotelian, to a Brechtian, to a Boalian approach.” (p. 393)<sup>[6]</sup>

It is also important to precise “that Augusto Boal’s work heavily relies on fellow Brazillian Paulo Freire’s *Pedagogy of the Oppressed* (2000) [...]Freire also draws on Piaget’s idea that knowledge is not transmitted but constructed. Freire’s pedagogy is based on the dialogue between educator and student, and on the student’s recognition that, even if he is illiterate, he already holds the key to knowledge.” (p.58)

These precisions indicate to us a link between the active learning and the theatre of the oppressed. As we have also a link with theatre of the oppressed and videogame, we have necessary a link between active learning and videogames. This triple relation is described by Monique Clavel-Levêque (p. 84)<sup>[7]</sup>: “The ludic experiment as small-scale model allows to make the economy of the lived experiment, it exorcises, it makes live emotions and impulses which the

*everyday life represses by procuration [...]But the small-scale model is also tool of knowledge: the theatre to understand the world, the circus to control it[...]*<sup>9</sup>

In our case the “circus” is the use step of the Serious Game (cf. The star in Fig. 1) and the active learning phase for pupils (cf. The star in Fig. 2) for the PBL.

Thanks to the “*theatre*” aspect, we have discovered a first link between PBL and Serious Game.

### 3.5 PBL and Serious Game: other similarities

In our preceding work, we have observed six similarities between PBL and Serious game. (p.260 to 261)<sup>[8]</sup>

Concerning the use step, we have found:

- The iterative approach
- The presence of the ludic aspect
- The presence of a mediator

We have also pointed out three common quests between PBL and Serious Games:

- Have to prove to a great number of persons their added values
- Have to find adapted systems of valuations
- Have to give an answer to a generation with an eagerness of interactivity

There are surely other links or points in common. This series of findings is not exhaustive.

However, the similarities are at this stage, already many and explicit to plan to study the reciprocity on the pedagogic level between PBL and Serious Game.

## 4 To find out reciprocity between PBL and Serious Game

### 4.1 Aim of the experience

In the chapter 3, we have found links and similarities between PBL and Serious Game. That normally means that PBL might be compatible with Serious Game on a pedagogic level. To verify this theoretical approach, we must check that the two approaches are reciprocal.

### 4.2 Description of the experience

The principle of the experiment is to merge PBL and Serious Game at the pedagogic level and to observe if both are brought mutually.

On the PBL level, we propose to students to create a Serious Game. The pedagogic aim is to understand how to create a multimedia application. The cognitive conflict is: “*can a serious game fulfil the same functions as a traditional multimedia application?*”. In this case, the teacher is the “*tutor*”.

On the Serious Game level, we propose to students to use their Serious Game in order to make discover an unknown trade to the pupils of the Secondary School. The pedagogic goal is in fact to allow students of the Secondary school to learn the definition of the selected trade. The cognitive conflict is: “*can a serious game fulfil the same functions as a traditional multimedia application?*”. In this case, the students are “*tutors*”.

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<sup>9</sup> “*L’expérience ludique comme modèle réduit permet de faire l’économie de l’expérience vécue, elle exerce, elle fait vivre par procuration des émotions et des pulsions que la vie quotidienne réprime [...] Mais le modèle réduit est aussi outil de connaissance : le théâtre pour comprendre le monde, le cirque pour le maîtriser [...]*”(translated by the authors)

The figure 3 resumes the experience:

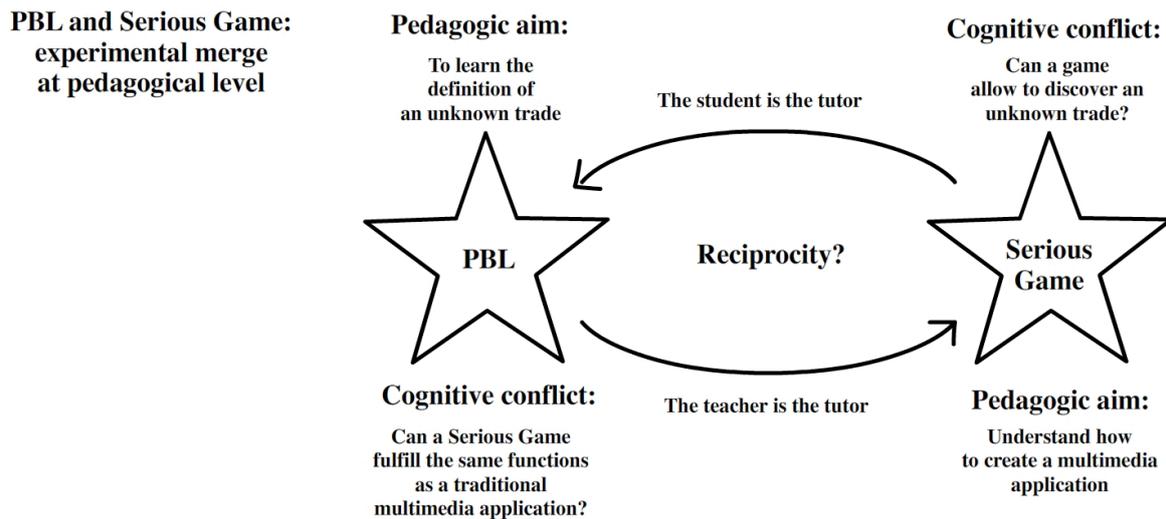


Figure 3: Diagram of the PBL and Serious Game experimental merge at pedagogical level

#### 4.3 Awaited results of this experience

The experiment will be conclusive if:

- the two pedagogic aims defined on 4.2 are achieved
- PBL and Serious Game make it possible to register the student in a virtuous circle of training

#### 4.4 Description of the of students

There are 30 students. They study the multimedia in the context of a first degree of multimedia at the IUT-SERECOM in Tarbes. They are about 20 years old. They just began to learn how to manage a multimedia's project by a theoretical approach. They also have discovered how to use some multimedia dedicated software like *Flash*, *Photoshop*, *Illustrator*, *Dreamweave*...

They have never made a Serious Game but they have seen during one day, lessons and videos, what is game design, gameplay, serious game and have tested different kind of serious games and video games.

#### 4.5 Description of the PBL

All the students have been invited to realize a Serious Game Project designed to deliver a message. Starting from a video game first entirely dedicated for entertainment, they have to transform it, in order to merge a serious intention.

How ?

The students have two nonexclusive possibilities :

- Change the pictures or the sounds of an existing video game
- Change the rules (the gameplay) of an existing video game

They have one month to realize the project and have been divided in 6 groups of around 5 students.

#### 4.6 The pedagogic objective of the Serious Game submitted to the students

Today according to several surveys and studies, in countries like Canada, France, USA... we know that young generations, between 12 to 24 years old, use more and more Internet and video games (Sauvé (p.54-55)<sup>[9]</sup>). The idea to communicate with this public by the means of Video

Games seems thus to be a relevant paradigm. According to this, the students have to design a Serious Game intended for to the pupils of the Secondary School in their final year of study. They are ready to leave the Secondary School and they have to make a decision concerning their future studies. The very idea is thus to help them to explore the professional world (Tricot<sup>[10]</sup>) by showing them in an attractive way trades that are unknown or fuzzy to them.

#### 4.7 Assessment of the project

The students have managed to realise all the components (Specification, Paste-up of multimedia, Questionnaires, Journal and Presentation) of their “serious games” in time. They have shown a fine involvement in realizing the project. This has been underlined by the fact that other teachers giving traditional lessons have noticed a big absenteeism rate concerning these students. That has not been notified within the PLB.

Finally, the acceptance of the teachers of the Secondary School having in charge to give lessons of professional discovery has been very good. They have found a concrete link between their program and the approach of the students coming along questioning the pupils of the Secondary School and introducing an unknown trade by showing the Paste-up of a Serious Game. A group of students has even been asked to talk about their studies in Multimedia. That is a real reciprocity!

On the whole, even though a minor group of students are still sceptic to this approach, this experience has been conclusive. The PBL and the Serious Games can thus be combined on a pedagogical level.

This result is thus in conformity with the writings of Gilles Brougère. He confirms this link in his book “*Jouer/Apprendre*” (To play/To learn)<sup>[11]</sup>. Game can be a way to learn. But we have to change our point of view about what to learn means:

*“To learn becomes a continuous activity, basically social, that accompanies in a conscious way or not, a number of our behaviors. It is starting from this vision of to learn that the game, as well of other activities, can be analysed like potential space of trainings” (p.160)<sup>10</sup>*

## 5 Conclusion

The aim of this paper is to indicate to us if most researches and conclusions about PBL can be adapted to those of Serious Games.

First we have found an important link between PBL and Serious Game in the way of their realisation. We have also enumerated six similarities, not exhaustive, between the PBL and the Serious Games that we can find in our preceding works;

Starting from these observations, we have made a pedagogical experience in order to find out the reciprocity between PBL and Serious Game.

This experience present conclusive results concerning the involvement of the students (a very low rate of absenteeism) and that the targets that were fixed at the start of the experience have been fulfilled. We have thus deduced that the PBL and the Serious Games were perfectly well adjusted to each other.

All these results, thus, allow us to conclude that it is possible to use most researches and conclusions about PBL to Serious Game.

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<sup>10</sup> “*Apprendre devient une activité continue, fondamentalement sociale, qui accompagne de façon consciente ou non, nombre de nos comportements. C’est à partir de cette vision de l’apprendre que le jeu, comme bien d’autres activités, peut-être analysée comme espace potentiel d’apprentissages.*” (translated by the. authors)

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