Do Students Trained Using Serious Games Become Better Sales Representatives? An Experiment to Study the Performance of Academic Serious Games

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Abstract

This paper analyzes the potential of serious games for professional and pedagogical purposes and learning. To do this, the authors have questioned the efficiency of these games. They present an experiment conducted with 66 students trained in sales that compares a group of players with a group of non-players. The game's impact on skills was studied from two angles: first from a theoretical point of view (based on the marks obtained in tests), and second from a practical point of view (based on professional situations). The responses for continuous variables (the marks) were measured depending on the two control factors (the type of training and past sales experience) and could each take two forms: on the one hand, the learning method (serious game group or test group) or on the other hand, depend on the past sales experience (with sales experience or without sales experience). As the level of experience was not identical in each of the four configurations, we found we were in a two-factor ANOVA configuration and followed an unbalanced plan. Whereas the results show that the serious game has a weak potential for students who are inexperienced in the field, they also underscore the fact that the game has a very positive effect on learners who are already experienced in sales. The serious game could therefore act as a booster. The authors have then highlighted the potential side effects of these learning tools, such as the formatting of profiles or the "Disneylandization" of business. To avoid this, they suggest the trainer's contextualizing role be reinforced.

Key words: Serious Games, ICT efficiency, Experiment

Reference:

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Introduction

"*You tell me, I forget. You teach me, I remember. You involve me, I learn"* B. Franklin

Video games today represent a market of almost 1.5 billion euros in France, thus making them the best-selling cultural products in that country. Their use has become more generalized, particularly appealing to females and older age groups. The widening of their usage and the increased awareness of users has enabled important development potentials to be foreseen. A promising future is also forecast especially for simulation games, called serious games, which have a pedagogical and professional aim. In fact, the revenue figures throughout the world for publishers of these games should thus be multiplied sevenfold between now and 2015, reaching 15 billion euros (IDATE study, 2010).

These learning methods have been widely developed since the 2000s (Ben Sawyer, 2002, Zyda, 2005). They belong to the type of computer-mediated environments of human learning, combining mediatised learning by machines, simulation, emotional reactions and professionalisation. At present, exactly what can be considered a serious game remains under discussion (Ulicsak, Wright, 2010). We have retained the definition given by Alvarez (2007): "*a computer application, whose initial intention is to combine both serious aspects (serious) [..], and fun elements from video games (game).Such an association functions by implementing a pedagogical scenario, which from a computer-mediated standpoint corresponds to revamping (the sound and graphics), a storyline and appropriate rules, and therefore has the aim of going beyond simple entertainment."* Large companies are the main clients for these products due to their high development costs. They use them for external communication; for example, to attract young graduates, as is the case for BNP Paribas[1] or L'Oréal[2], or for the further education of their personnel, as is the case of Cisco [3] and Hilton Garden Inn[4].

The use of these types of games for initial training, which could be called "academic serious games", remains marginal. It is generally aimed at simulating technical skills, for example, for surgery or flying. In soft sciences -- and more precisely, in management science -- company management simulations exist, but without the strong elements of immersion and emotions. This situation reveals that there is a lack of knowledge of the impact of these games when they are used for educational purposes: "*A large part of the research carried out does not concern the use of games in the context of school teaching; and it is precisely at this level that teachers' needs are situated. In addition, precise areas of analysis would have to be investigated. For example, the impact of each type of game on specific skills, in particular learning contexts, the impact of games-based learning on subject-specific skills*" (European Schoolnet, 2009, p.158).

This article therefore aims to analyse the potential of academic serious games by studying the performance of these games from the perspective of the skills developed by the learner. To do this, we have proceeded in three stages: through an analysis of the literature, we specify the characteristics of serious games and describe the context for the development of the academic serious games. This highlights the difficulties of measuring the performance of these games. We then justify our use of experiments and give details of the study protocol and the indicators chosen. Finally, the results are presented and discussed.

1. Analysis of the performance of serious games for learning

Firstly, an analysis of the literature will make it possible to describe how serious games have emerged and their conceptual characteristics. Then the use of serious games in the specific field will be studied. Finally, the difficulties in measuring the potential and the performance of this type of game will be shown.

[1] www.starbankthegame.bnpparibas.com

[2] www.reveal-thegame.com

[3] https://learningnetwork.cisco.com/docs/DOC-7635

[4] http://www.satoworks.com/Serious_Games.html

1.1. The emergence of serious games

Michel et al. (2010) divides the history of serious games into four periods: first, with the arrival of learning machines and the Pressey Drum Tutor Pressey in 1924, learners became responsible for their own learning. Then simulation was introduced in 1946 with the MIT Whirlwind project, which enabled military airline pilots to train in a controlled situation. Learning was then achieved by trial and error in a systematic approach. The state of flow (Csíkszentmihályi, 1990) and immersion was thus found to increase. The democratization of video games then made simulators available to the general public,

They conclude by describing that a phase of professionalisation in simulation games has been taking place since the 2000s. Games are again being used in professional training, but in a broader way and not only for gaining technical skills. Serious games can therefore be presented as technologies and video game platforms which have objectives other than simple entertainment (Michael, Chen, 2006; Vorderer, Ritterfeld, 2009). This virtual experience would aim at reengaging learners.

1.2. The potential of serious games for initial training: academic serious games

This article is specifically concerned with the use of simulation games for initial training, what we can qualify as 'academic serious games'. The reintroduction of amusement as initiated in particular by Prensky (2001) and Gee (2007) has led to the appearance of the concept of *edutainment*. The commonly defended idea is that learner will be more interested in the subject thanks to the pleasure and the wealth of experience gained during the game. This increased interest and motivation leads to broader and more deep-seated learning processes. It would be wrong for teaching to disregard the fun aspect. As there is a lack of specific studies on serious games, we have turned our attention to a broader study of the pedagogical virtues of video games about which a wealth of literature is available (see the summary of Pivec and Pivec, 2009).

From their outset, the potential of video games as vectors for learning was recognised (Malonne and Lepper, 1987). More so than for other learning systems, their immersive nature was seen as an advantage that would stimulate learning. (Mac Mahan, 2003 ; Paras Bizzocchi, 2005; Kaerney, 2006). Numerous institutional studies (Federation of American Scientists, 2006; Project Tomorrow, 2008) confirmed the idea that video games endow players with skills that are useful in a degree course and which can, moreover, be transferred to the business world. This explains the call to adopt video games for pedagogy. "*Revamp old pedagogy to take advantage of these new educational tools*" (Federation of American Scientists, 2006).

Nevertheless, this optimism regarding the intrinsic value of games as a means of education needs to be tempered. In 2006, de Freitas admitted that one of the elements that hinder the spread of games in the context of training is the lack of data making it possible to prove their effectiveness. There seems to have been little evolution since then, as, in their recommendations in 2010, Pivec and Pivec called for researchers to intensify the rate of data collection in particular through pilot experiences. In their view, the applications of serious games in the field of education are very recent. As proof that we are in fact at the tentative stage, Ulicsak and Wright 2010 report that a study carried out in Great Britain in 2009 by the FuturLab only enabled a very small number of responses to be collected. They explicitly recognised that knowledge is lacking as to the usage of serious games in the education system and made data collection a priority.

1.3. The assessment of the performance of serious games

In order to contribute to a greater knowledge of the potential of serious games and their performance for learning in further education, we have based our studies on the works of Kirkpatrick (1994), who proposed assessing the contribution of a learning method according to four levels:

- Level 1: Reactions (did the learners appreciate the training?)
- Level 2: Learning (what did they learn?)
- Level 3: Behavior (were the learners able to apply their new skills in the particular situations?)
- Level 4: Results (did the organization or the company improve its efficiency by training its employees?)

We will concentrate on levels 2 and 3 with the aim of understanding if the use of a serious game can develop individual skills.

2. Method of collection and data analysis

This part justifies the choice of an experimental approach and specifies the three methodological decisions that were chosen. It then gives details of the protocol for the data collection (samples, segmentation variables and measuring indicators). Finally, we have specified the methods for analysing the data and the statistical tests.

2.1. Using experiments

We chose to use experiments to study the impact of learning by means of serious games. In fact, in this type of study one or more independent variables (here the use of SGs for training and prior sales knowledge) are modified by the researcher, whereas all the other factors are judged to be constant. We can therefore study the effects of the independent variables on a certain measured variable (the dependent variable; here, the performance of the students). Therefore this study could either lead to the confirmation of the hypothesis (Hempel, (1966)) or to the proposition of another hypothesis by making causal inferences about the effects that the independent variables have on the dependent variable. The aim of the experiment is thus to interpret the relationship between the presupposed causes and the observed effects in the simplest possible way whilst ensuring the reproducibility of the protocol. Three decisions were made to structure the study process:

First, the participants in the study received compensation in the form of a school mark or potential recruitment by professionals. Using these sorts of incentives (financial or other) has become a hotly debated issue. According to Etchart-Vincent (2006), the community should adopt a pragmatic view and should choose on a case by case basis whether to give subjects compensation or not and in what amount. With this view in mind, we established a “compulsory” compensation in the form of a mark and a more “dynamic” compensation in the form of an offer of recruitment for the participants obtaining the best results.

Second, clear instructions as to the objective of the study were given. No false information was transmitted regarding the task assigned to the subject in order not to “pollute” the experimental approach (Hey, 1991). This led to two difficulties: first, the behaviour did not reflect reality, as it tried to comply with false or incomplete information. Second, deviating behaviour appeared, or even refusals to participate on the part of the subjects who had been disappointed with their first performance. Confidence is therefore essential and is gained through real and clear instructions.

Third, the experience requires considerable contextualization, particularly during the situational scenarios (use of real sales materials, installation of shelves in the rooms, etc.). This should make the experiment more realistic, and encourage the participants when they carry out actions similar to those that are part of their usual behaviour, thereby ensuring the reliability of their results (in experimental psychology, one speaks of ecological validity). We were therefore seeking external validity to enrich the precise fields of application. The contextualized experiences enabled criticisms of nonrealism and artificiality to be avoided.

2.2. Context of the study and samples

The experiment was carried out with a class of 66 students in the first year at the Chambery Graduate School of Business. The sample was made up of 66 participants, of which 40 were men and 26 were women. Their average age was 21 years old. An analysis of their previous studies, as well as a questionnaire, made it possible to distinguish the students who had past sales experience. The sample was divided into two groups chosen randomly by the lecturer-researcher from the roll in alphabetical order. Each group was therefore representative of the parent population of the sample in terms of their previous studies and type. The entire class attended a five-day compulsory seminar for training in sales techniques. Theoretical presentations and situational scenarios were presented together during the 30 hours of this seminar.

2.3. Protocol for the experiment

The two groups had 28 hours of joint training during the seminar. Then they each took part in a different activity for two hours. The first group was named the “serious game group”. It was made up of 35 individuals who had had access to a simulation game called “The Seven Buying Habits”. This game was developed by the Daesign[5] company for a large French bank. It was used to train hundreds of account managers to recognise the profiles of purchasers, with a view to adapting the way interviews were conducted. The game presented increasingly difficult activities. They varied from presenting the characteristics of the seven profiles, to simulating the sale of a financial product, to recognising the indices making it possible to categorize a client. The game proposes dialogues between an avatar directed by the player and a client directed by the machine

The dialogue progresses (i.e. the client's reactions) according to the choices made by the player. After each of the activities, each of the learners was given a debriefing, included in the game.
So, all 35 students had access to a serious game for two hours. They played individually, in a specially-equipped computer room. The second group was the “test group” made up of 31 students. This latter group was given a fixed time of two hours to individually read the descriptive documents presenting the seven types of buying behaviour. These were the theoretical support documents used for the game by the first group. This made it possible to guarantee that the two groups had access to the same content, but different methods of teaching.

	Without sales experience		With sales experience		
	M	W	M	W	Total
Group Serious Game	14	10	8	3	35
Test Group	13	3	11	4	31
Total	40		26		66

Table 1 : Makeup of the sample

2.4. Indicators for measuring performance

The indicators used to measure the performance of the learning method were the marks obtained during three assessments at the end of the seminar (each group's own training and activity):

- The first indicator was the theoretical sales mark obtained in an individual test based on general knowledge of the sales process. Through open questions, the test assessed the ability to summarize all the declarative information connected with sales. The mark was given by the sales lecturer.
- The second indicator was a specific theoretical mark obtained in a test based on detecting buying behaviour, such as is described in each group's own activity. The test focused on the

[5] www.daesign.com

memorization aspects and was presented in the form of multiple choice questions. The mark was given by the sales lecturer.

- The third indicator was an operational mark. The test aimed to measure the ability students' ability to use their knowledge during actions (assessment grid in the appendix). It was presented in the form of a situational sales scenario: Ten companies each proposed a sales sketch that the students would work on. They provided them with the sales material and trained them for two hours on the products or services they marketed. The students had a day to prepare the sketch, which lasted about 20 minutes. The role of the client was played by the professional salesperson and a teacher assumed the role of observer. This activity, called the "Sales Challenge", was assigned a mark by the professionals. The best student-sales representatives were also offered work placements and even employment in a sandwich course. This was an element that ensured the correctness of the assessments made.

Each student thus obtained three marks: the theoretical sales mark, the theoretical adaptation mark and the operational mark, respectively.

2.5. Data processing method

The responses for the three continuous variables (the marks) were measured depending on the two control factors (the type of training and the past sales experience) and could each take two forms: on the one hand, the learning method (serious game group or test group) or on the other hand, depending on the past sales experience (with sales experience or without sales experience). As the number of experiences was not identical in each of the four configurations, we found we were in a two-factor ANOVA configuration and followed an unbalanced plan. Because of the way we had composed the population of the study, we opted for a model with a fixed effect with a study of the interactions. This last point was appropriate because of the desire to identify the crossed effects between the initial knowledge and the learning method. For each of the three variables, the independence of the errors was ensured by a matching technique. No dependence could be visually observed when the graphs were examined. The homoscedasticity (Levene's test) and the normality of the residue (Kruskal-Wallis test) were previously verified. In each of the situations, the three conditions for applying the ANOVA were met. The threshold for the tests was fixed at 90%. An analysis of the contrasts and the multiple comparison tests was made post hoc with the aim of categorizing the effects. For these, the adapted version of the Tukey procedure was used as the plan was unbalanced.

3. Results and discussion

The serious game used in the experiment was based on a sales theme and its adaptation to customer buying habits. The results first described the lack of potential of this serious game in the discovery stage, that is to say, for the students who had no sales experience. The results highlight the advantages of this game during the skills reinforcement phase, for learners who had previous sales experience. Elements for interpreting this "booster effect" should be contemplated for the simulation/enactment contrast.

3.1. A game which increases the differential of theoretical knowledge

As regards the first indicator which assessed general sales knowledge (theoretical sales mark), the students who did not play the serious game obtained an average mark estimated at 12.5/20. As for the students who did play, they obtained an average estimated mark of 12.77/20. This difference of 0.25 points in favour of the serious game group was minimal and not significant. Having played a serious game did not make a positive difference when compared with the traditional training process. On the other hand, the theoretical sales mark was affected by the fact that there had been prior experience. In fact, the average mark for students who had previous sales experience was1.44 points higher than that of the others (13.36 compared to 11.92). In other words, a week's training is not enough to compensate for the differential effects of prior knowledge.

To investigate further, we divided up the population according to the significativity of the "difference in averages" criteria. Two separate classes appeared: within the serious game group, the students with sales experience performed significantly better than those without experience (14.00 compared to 11.54). The simulation game made the gap wider. We therefore obtained two pieces of information

from this: learning through this serious game seemed adapted to students who had had prior sales experience, while traditional training appeared more beneficial to students without sales experience.

Concerning the second theoretical indicator in the form of MCQs based specifically on buying habits, no effect of any sort was observed. This can be explained by the actual protocol for assessing memorization. The minimal difference in the results could have resulted from a relatively simple examination subject not enabling a sufficient variance to appear. In future experiments, questions related to memorization should be readdressed. In a general way, we could question the relevance of theoretical methods of evaluation for a learning process that aims to use situational scenarios.

3.2. The same type of impact during the situational scenarios

The third indicator was an operational mark attributed by the professionals in actual situational scenarios. The results showed a significant effect that was due both to previous sales experience (14.35 compared to12.65) and the interaction between the training method and previous experience (Pr>F= 7.66%). A study of the graph of the averages shows an antagonistic effect. For the students who had not had sales experience, playing a serious game diminished their operational results, whereas the inverse effect was seen for the students who were already familiar with sales. The marks of students who had not had sales experience were 0.77 points lower (11.54 compared to12.31). For students who had had sales experience, the effect was the opposite. The serious game gave them a mark 1.27 points higher (12.73 compared to 14).

The lack of significativity of the learning method (the risk of considering the difference between 13.55 and 13.46 as being significant is =89.60%) clearly emphasizes that a study of the effects must form part of the previous knowledge. From an aggregate viewpoint, the impact is not visible as the effects of the serious game training vary in an opposite way, depending on the knowledge of the students. By dividing up the population according to the significativity of the “average difference” criteria, the two same separate classes reappear. Within the serious game group, students with prior sales experience are significantly better at an operational level than the others (14.90 compared to12.02). This game therefore enables students with sales experience to widen the gap. For students without sales experience, the traditional method of training remains the best adapted for developing operational skills.

In other words, there was a booster effect which was even more prevalent than in the theoretical part (because of the significativity of the interaction). When the pool of knowledge and skills makes it possible to gain an advantage from the game’s contributions, the learners largely improve their level. When the learner does not have the possibility to incorporate the elements proposed, traditional training methods must be used.

The booster effect: an explanation based on the simulation/enactment contrast

In order to understand how this “booster” functions, we propose looking again at the notion of simulation. The learners use a simulation game with the aim of reproducing a situation that they consider to be real or authentic. The serious game used in this experiment uses plausible case scenarios connected with sales. Therefore students who have had previous sales experience find it easier to contextualize the game by comparing it with situations that they themselves have really experienced. As they already share a common language with that found in the elements of the game, they are able to project themselves into the game and thereby obtain better results. However, the representations of the initial reality vary according to the individuals. Therefore, students who have had no sales experience do not share this common language. Their representations of sales situations are fictional or imagined. They do not have a simulation experience, but one of enactment (Baudrillard, 1981).

Conclusion

The aim of this article has been to analyse the potential of serious games for training. The performance of these games was studied in terms of the impact that the virtual learning experience can have on theoretical knowledge that is assimilated and the operational practices that are developed. In order to do this, an experiment was carried out with 66 students trained in sales. Before describing the results, it appears to be necessary to temper them for at least three reasons. First, the

sample was quite small. A subsequent experiment on a larger scale is foreseen. Second, the absorption of the acquired information and the stability of the results over a period of time have not been verified (absence of follow-up test). Third, the students only used the serious games for a short period. It is planned that they will be used for a longer period when the protocol is renewed, which will also cause difficulties when proposing equivalent activities for the reference group.

Having specified these deficiencies, the results of the experiment nevertheless show that the game has a very positive effect on those who have had previous sales experience. By capitalizing on concrete and realistic references, these students will approach the serious game as a game of simulation, faithfully reproducing reality and perhaps making it possible for the learners to improve themselves. A “booster” effect is thus observed with a great improvement in theoretical knowledge and operational skills. On the other hand, serious games have limited potential for students who are novices in the field.In fact, when lacking prior concrete references, these students could consider a serious game not in terms of a simulation game, but rather a “game of enactment” based on situations judged to be fictional. They will not gain much benefit from this, neither from a theoretical nor an operational point of view.

The use of serious games as a learning method in initial training to improve the learning performance therefore necessitates taking the profiles of the learners into consideration, and in particular their previous experience in the field studied. In the situation analysed here, the game is not at all a discovery tool, but, on the contrary, a support tool for increasing skills. Finally, the use of such technical processes puts the role of the teacher in question. Far from being excluded from the almost automatic learning method, the trainer must, in our view, play a key role in the use of the serious game. We think, as do other researchers, that contextualization is necessary. In fact, for Garris et al. (2002), the main part of the training takes place during the debriefing phase. The value of the game is therefore not in the game in itself, but rather in the situation into which it fits (Wainess, 2007). Moreover, the work of contextualization enables “deviant” behaviour to be avoided: serious games make training through trial and error possible, remove all risks in a protected environment, and often lead to the students being tempted to adopt behaviour in this virtual situation that is socially unacceptable.

Whether the trainees consider the game to be a game of simulation or one of enactment, it is essential for them to be aided when they transfer the virtual experience to a real situation. The contextualizing work of the trainer could therefore contribute to ensuring that the serious game, designed as an element for making the learning process engaging, does not lead to the development of a caricatured vision of the business world and does not itself become a “Disneylandization” tool.

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Appendix 1: Statistic Results

"Theoretical Sales mark"

Source	DD	S	M	F	Pr >
Sale experience (Sales vs Non Sales)	1	31,74	31,74	3,78	5,63
Learning Method (SG vs Grpe Test)	1	0,03	0,03	0,00	95,62
Sale experience *Learning Method	1	15,86	15,86	1,89	17,42
Erro	62	520,33	8,39		
Corrected total	65	567,95			

	Estimated average	Group
Sale	13,367	A
Non Sales	11,927	B

Pr >
5,66

	Estimated average	Group
S	12,771	A
Grpe	12,523	A

Pr >
73,91

	Estimated average	Group	
Sales* SG	14,000	A	
Sales*Grpe Test	12,733	A	B
Non Sales*Grpe Test	12,313	A	B
Without* SG	11,542		B

Table 2 : Effect of the learning method on Theoretical Sales mark

"THEORETICAL ADAPTATION

Source	DD	S	M	F	Pr >
Sale experience (With vs Without)	1	0,05	0,05	0,01	93,59
Learning Method (SG vs Grpe Test)	1	1,98	1,98	0,25	62,17
Sale experience *Learning Method	1	0,50	0,50	0,06	80,41
Error	62	498,56	8,04		
Corrected total	65	501,09			

	Estimated average	Group
Non Sales	16,771	A
Sales	16,648	A

Pr >
86,66

	Estimated average	Group
Grpe Test	16,904	A
SG	16,515	A

Pr >
59,37

	Estimated average	Group
Sales*Grpe Test	16,933	A
Non Sales*Grpe Test	16,875	A
Non Sales * SG	16,667	A
Sales * SG	16,364	A

Table 3 :Effect of the learning method on "THEORETICAL ADAPTATION"

"OPERATIONAL MARK"

Source	DD	S	M	F	Pr >
Sale experience (Sales vs Non	1	47,45	47,45	7,15	0,96
Learning Method (SG vs Grpe Test)	1	1,72	1,72	0,26	61,23
Sale experience *Learning Method	1	21,51	21,51	3,24	7,66
Error	62	411,39	6,64		
Corrected total	65	482,08			

	Estimated average	Group
Wit	14,350	A
Without	12,657	B

Pr >
1,26

	Estimated average	Group
Grpe	13,547	A
S	13,460	A

Pr >
89,60

	Estimated average	Group	
Sales*	14,900	A	
Sales*Grpe Test	13,800	A	B
Non Sales*Grpe	13,294	A	B
Non Sales *	12,021		B

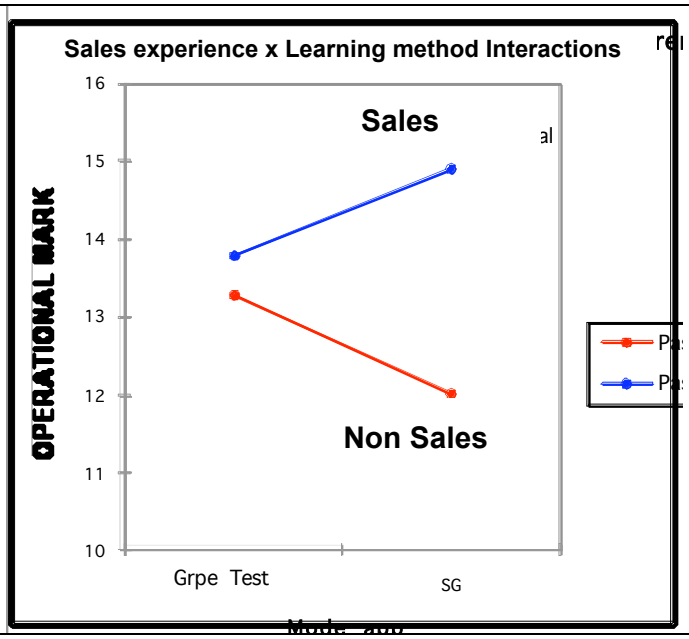

Table 4 :Effect of the learning method on "OPERATIONAL MARK"