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Comparison Between Video-class and LEGO Serious Slay Learning Strategies for the Students of Engineering Discipline*

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The knowledge exchange in higher education is growing day by day demanding more advanced methods of teaching rather than the old methods. This paper presents an approach that tracks and measures changes in learner's behavior, based on two main learning strategies: video – class and LEGO serious play. The objective of the work is to address the question; Does the change of the learner behavior affect the quality of engineering education?. During this research work, an online task for the purpose of enhancing the process of learning, based on LEGO® SERIOUS PLAY® methodology, as an innovative technique to explore and support the changing in the learner behavior while solving the designed task. During the planned experiment we used gamified education material that has resulted in capturing the quality criteria by following the behavioral level of the Kirkpatrick Model. A comparison was performed with a class based on learning through video presentations and a class based on "LEGO® SERIOUS PLAY®" to learn the designed task. The total number of participants was 26 in 1st experiment and 18 in the 2nd experiment, a total of 44 participants. The results have shown that the "LEGO® SERIOUS PLAY®" class was more oriented into the creative part of the knowledge acquirement. However, the "video-class" was limited to the content of the video and to the video's visuals design. From the obtained results, the goal has been achieved by measuring the changing of the learner behavior, in the same context, these behavior changes and the learning processes have been measured and improved.

Keywords: behavior; Kirkpatrick Evaluation Model; LEGO® SERIOUS PLAY®; open educational resources; quality model; gamification

1. Introduction

The processes of education to share and receive knowledge is an intellectual capital for creating values in learning and teaching, which is increasing every day. Sometimes engineering students with a lack of confidence and support system, struggle to find a guide to a better understanding of an engineering module and face some problems in catching up with the theoretical concepts [1]. However, using different teaching techniques continues with the same typical teaching methods and the need for creative methodologies and gamification techniques, such as the "LEGO® SERIOUS PLAY®" is increasing as well. Where the improvement of the student behaviors can directly affect the improvement of teaching quality to have a good performance, new behavior, and better success rates. This Method is a technique that improves group problem solving by utilizing the visual solution, auditory and building skills are oriented for Engineering learners of Engineer discipline. Also, giving them an equivalent opportunity for sharing their vision contribution of different ideas in the same purpose with an intended to have better success rates, performance, and engagement. Therefore, the new changes in teaching techniques with innovative resources and materials, and the use of gamification resulted in obtaining better academic results and rates for better student behavior. On the same hand, the use of gamification methodology will innovate the designing of learning processes that will improve the use of different learning techniques for better knowledge delivery [2, p. 101–138]. The finding research shows that a deeper and better understanding of the educational material has been produced and visually presented to the students in order to change their behavior [3]. Where, the learner advanced better communications skills, imaginations engagement, more confidence in themselves, commitment, and richer understanding [4]. The purpose of this work is to enhance teaching quality within the use of gamification techniques, for the better acquirement of the expected learning results. In particular, by following a set of objectives will help to obtain in upcoming phases:Improve the process of learning by measuring the changes in the behaviour of the learner and increase the quality level of teaching by enhancing the way we deliver knowledge.

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(a) Having an innovative opportunity in the way we represent knowledge and blind learning materials.
(b) Capturing some quality attributes by studying the behaviour of different learners while performing a visual task.
(c) The designed task which includes innovative teaching strategies such as gamification methodology as an application of learning by visual material offers a facilitated problem-solving process, team working, time management, in which learners are led through a series of questions, explore deeper into understanding the subject.

In support of this approach, the Kirkpatrick Evaluation Model by Donald Kirkpatrick is very known as an evaluating training program method to measure the effectiveness of training. It was developed in the '50s, where it was officially published in a trade journal followed by several revisions and updates [5]. Reaction criteria, learning criteria, behavior criteria, and results criteria are the four levels of Kirkpatrick's model. The object of this research is to identify quality criteria by following a set of requirements by the behavior level of the Kirkpatrick Model, then by applying them to LEGO® SERIOUS PLAY® methodology which is an innovative process that was designed for better techniques of learning and knowledge acquirement. In this context, the definition of behavior is the degree of how much the students are learning, applying what they have learned, skills improvement, and behavior change. However, measuring the transferred data of knowledge, all the changing of experience, and practice of skills from training applying them to a task is not easy to measure. For example, some circumstances such as an individual's refusal to change counts as a failure of behavioral change. A questionnaire or checklist is usual method to measure it. However, the obtained maturity of knowledge by e-learning must be giving a chance. This means that this measurement is happening after a short time of the finished course. In this case, online questionnaires were made to conduct and collect data. Moreover, regarding such measurement, if the learner solves the questions in a creative way that leads to the correct answer to the changed in his behavior results "Positive". However, if no change "Negative", then the new result has been obtained regarding getting the answer of the main research question, supporting the "null" of the hypothesis, assuming that there was not a direct effect from the process of learning on the students and they haven't gained what was expected. On the other hand, it is opposite if the hypothesis is "alternative". In this case, the behavior requirements have been studied to follow this method of adapting to LEGO® SERIOUS PLAY® methodology.

The context and main goal of this method are providing an effective, creative, and useful learning tool for the learner's own assessment in a way of contextualizing their learning. Furthermore, using visual material to teach by offering time management, team working, facilitating the problem-solving process, in which learners are exploring in deep understanding the subject and directed through a series of questions are called innovative strategies where gamification methodology was used to design the task as an application of learning [3]. Moreover, LEGO® SERIOUS PLAY® is an innovation methodology that was used in the experimental process designed to enhance business performance. As Plato said: "You can learn more about a person in an hour of play than you can from a lifetime of conversation" [6]. The essence of this method as it has been mentioned that there is a reflection of quality improvement on education material. Where for the designed experiment the information about the development of subjects has been used as part of creating the online task. This is all for resulting in a better performance of the students and the process of learning, as an intention for better success rates compared to previous years. Moreover, by obtaining better academic rates, it proves that this change in learner's behavior, with the use of innovative resources, techniques, building skills, utilizing the visual solution, and explore deeper into the subject of educational materials reference of what factors are influencing the quality of the process [7]. On the other hand, in the next section, we are presenting a case study

1.1 Case Study: Improve Product Development Planning by Providing Tools to Visualize Assumptions Behind Software Development

In this section, we are presenting a case study of the use of LEGO® SERIOUS PLAY®. This case study is a part of a research work done by Juuso Hyvönen's master thesis at the department of computer science, University Of Helsinki. The main objective of this work is to explain the value creation process in software development, providing a visual tool to develop better business goals and link them to a real-life situation. This case study estimates three planning techniques for supporting the best supply "backlog" items at the right time. It helps the company and its customers to reach specific business goals. This experiment was held at two of the Finnish's medium-sized software companies. One of the two companies only focuses on the business-to-business (B2B) field. The other company also works in the same area but also with business-to-

consumer (B2C) experiments where there is a difference between both environments.

The followed research methods for such study are action-oriented research. In this kind of case study, the researcher participates as an agent for change in the experiment. Usually, the researcher plays the role of an observer. Most often this method is done at organizational development and the private industries [8, p. 91–109]. The style of this study is descriptive and narrative, where it fits the nature of its mine purpose. Two LEGO® SERIOUS PLAY® workshops were designed and arranged to test the given methods. The purpose of these two workshops to understand the feeling and to get the feedback of the participants. During this work, 32 feedbacks, actions, and the reactions of the participants have been collected after the workshops. Lean Canvas has been used in order of an adaptation of the Business Model Canvas. Where the participants had to draw their process of design on the paper canvas. Also, for better observations, the workshop has been photographed in order to follow the given time and recorded those changes in reactions. This study took almost one year and six months to finish included many workshops. But in this case, we are interested in two workshops the LEGO® SERIOUS PLAY® 's workshops of all the workshops in as we mentioned before. In some cases, the participants were asked to study the methods before having the workshop. In some cases, a short presentation was given to the participants about the idea in general then the facilitator kept the workshop under control. The facilitator explains how to use the Lean canvas method [9]. However, the LEGO® SERIOUS PLAY® two workshops were explained by two researchers specializing in service design.

The two workshops were held for Steeri products as there two developers who specialize in service design were facilitations of the experiment. The two workshops were held for Steeri products as there two developers who specialize in service design were facilitations of the experiment. The product support person, team leader, salesperson, developers, and product owner were the participants of the two workshops that have 6 hours' duration. There were asked to create a shared vision of the Product as it is the main goal of both workshops. As the challenges of the workshop are the following : To Build a tower, Building an ideal neighbour, Building a typical Monday, Create a representation of the ''Product'' user, Create a big challenge of your user, Finding a solution to the challenge, Building a future vision of the ''Product'' in an ideal world, As a team build an answer of the previous challenge On the Lean canvas, and the participates represented the elements of the storytelling with the Lego bricks. A note of description was next to each model, also all the canvases were photographed. In the end, the facilitator handed the participants a booklet with a summary of their own point of view.

2. Overview

In this section, we are introducing the methods that been used for analyzing the collected data during the experiment phases. In each School, been studied the experiment of its two samples ''learner experience during ''Video Class'', and ''LEGO® SERIOUS PLAY® learner experience in face-to-face classes''. For a deep understanding of the data, it was divided the analyses into three sections: analyzing two questionnaires and the data been gathered from two samples of study from the ETSIINF ''La Escuela Técnica Superior de Ingeniería Inforámticos De UPM'', The class of ''Information Technology Process Management'', course of ''Design of a new business model'' performed on 26 undergraduate students of the 4th year, and ETSIAE ''La Escuela Técnica Superior de Ingeniería Aeronautica De UPM'', class of ''Aerodynamics and Flight Mechanics'', the course of ''Characteristic speeds and take-off and landing distance calculation of an aircraft'' performed on 18 students of the 3rd year class . Following that, the results been compared from both samples that been conducted. Finally, the given survey been analyzed and the Z-score and the Q factor been calculated, that been obtained from both samples. In brief, the steps that been followed are shown in Fig. 1.

2.1 Experiment Strategy

The experiment's strategy was applied to two different university student groups. A survey was conducted, in order to know the sociodemographic indicators, such as age, educational level, gender. Following that, an introduction of each phase has been given to the groups followed by the first questionnaire after acquiring the ''Video-class'' experience. The ''Video-class'' was taken from two different courses of ''Business Model Implementation'' and ''Calculations Distance and speed'' from Delft University of Technology's account on edx.com. Later on, the same groups of students from both different schools have taken the second questionnaire after acquiring the ''LEGO® SERIOUS PLAY®'' experience as exploratory tools for ''Storytelling'' as they explain their Business Model Roadmap on a given A3 paper canvas. Also, the groups were given a quiz of three questions regarding the topic they have learned after the task of ''video-class'' and they were asked to present their design and results after having the LEGO® visual

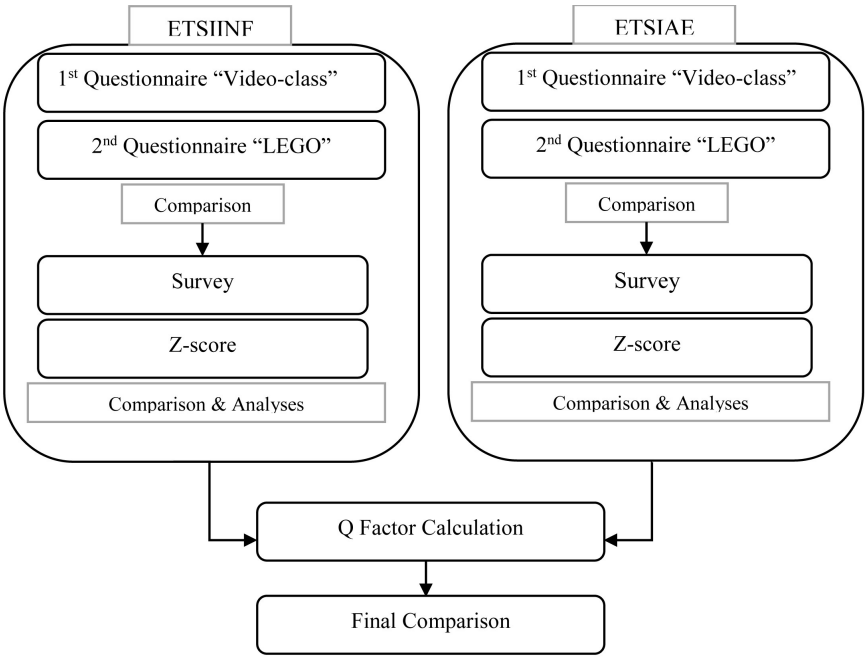

Fig. 1. Analyses Planning.

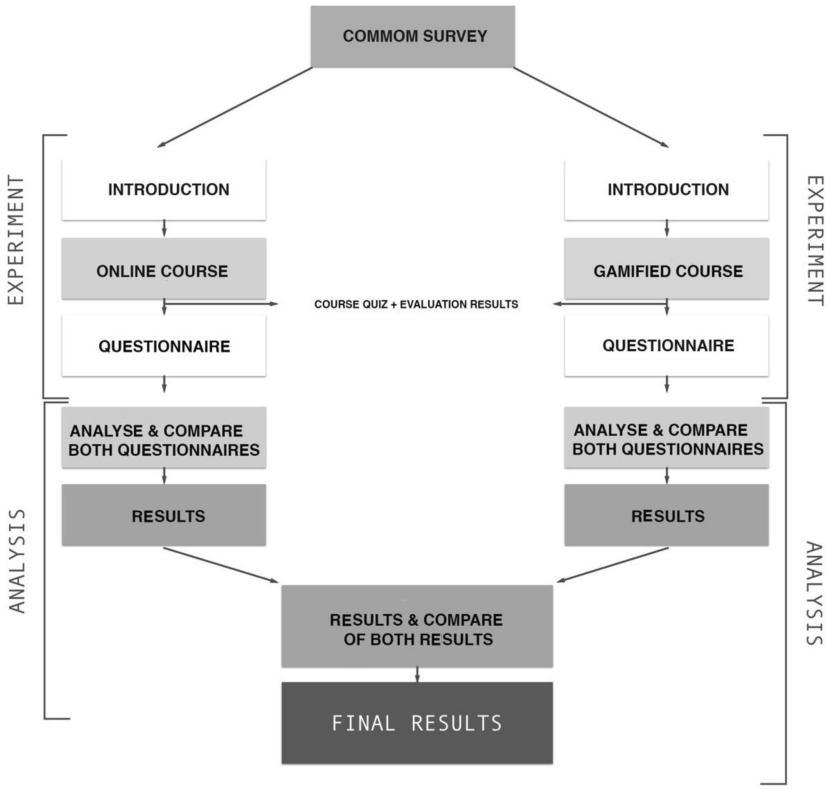

Fig. 2. The structure of the experiment.

task to be evaluated by the teacher. Moreover, it helped to measure the changes and the understanding level after taking each course. Fig. 2 shows the structure of the experiment:

2.2 Processes Management of Information Technology (ETSIINF)

The task assigned to the students of the ETSIINF "La Escuela Técnica Superior de Ingeniería Infor-

ámticos'' De UPM who attend the ''Information Technology Process Management course'' consisted of the design of a new business model for a family business, where they had to create a new business plan for a music store that is going out of business. To solve this task, the different groups should be able to design Business Model Roadmap. This is a tool of 7 steps, in which students must define: the main changes they wish to apply to the current business model of the company and orderly define the necessary actions related to people, stakeholders, technology, and financing. Finally, the groups used the LEGO® Starter Kit as exploratory tools for storytelling as they explain their Business Model Roadmap.

2.3 Characteristic speeds and take-off and landing distance calculation of an aircraft (ETSIAE)

The task assigned to the students of the (ETSIAE) ''La Escuela Técnica Superior de Ingeniería Aeronautica'' De UPM, who attend the ''Aerodynamics and Flight Mechanics course'' where the student has to calculate the speed of a flight while taking off and lading as it consisted in the development of two scenarios. In the first one, the take-off and landing of the airplane had to be successful in order to save it from a crash. In the second, the plane had to go through some difficulty with speed calculations and errors to make it crash. To solve this task, the different groups had to use the previously acquired knowledge in the subject. Likewise, students had to use mathematical formulas to calculate speeds and distances. Finally, the groups used the LEGO® Starter Kit as exploratory tools for storytelling as they explain their scenarios by applying them on a Business Model Canvas. Where they created a timeline of both scenarios.

3. Results

3.1 Survey Criteria

The demographic data was collected in order to have an idea about the sociodemographic indicators. From a sample of 30 students at ETSIINF (all students), (25) were males and (5) females and ETSIAE a sample of (21) participants (all students), (16) were males and (5) were females. On the same page, the age range of the students went from 18 to 34 years old for both schools. For the majority (87%) of them where the age range went from 18 to 24 years old, while the remaining minority (13%) varies where the age range went from 25 to 34 years old at ETSIINF. And, for the majority (95%) of them where the age range went from 18 to 24 years old, while the remaining minority (5%) varies where the age range went from 25 to 34 years old at ETSIAE. Regarding the indication of employment, it can be seen that half of the students are ''Employed'' and the other half are ''Unemployed''. However, the reason behind the high rate of ''Employment'' might be due to the education level of the students enrolling in the last year of their studying career where students tend to have a training or a job for better real job hunting (Technical Job) after finishing their studies at the ETSIINF. However, it can be seen that almost it is opposite to the ETSIINF study case, where at ETSIAE only (2) students were ''Employed'' while the rest were ''Unemployed'' at that moment. However, the reason behind the low rate of ''Unemployment'' might be due to the education level of the students enrolling in the last year of their studying career where students tend to have harder subjects to study at the ETSIAE. Finally, for the kind of job that the students were doing at the time of the experiment. There were different work/specialization sectors where the students are currently studying or working in. With more than half of the choices, one dominant sector is ''Software'', followed by ''Consulting and Service'' with (17%) and then the remaining sectors with (3%) each one (Sales, Construction/Installation of Equipment and Media). And, at ETSIAE where the students are currently studying or working in. ''Education'' is the most selected work/study sector with 7 choices (33%), while ''Sports/Culture'' has (3) choices and the remaining two options (''Administrative/Financial/Accounting'' and ''Other'') has only (1) choice each one.

3.2 Z-score

In order to have accurate results and a better understanding of the data that been collected, were to indicate the amount of how many standard deviations an element is from the mean is by using the standard score Z-score. Moreover, the following formula (Equation (1): $(Z = (X - \mu) / \sigma)$), Where the Z can be calculated for the Z-score. Also, X here is the value of the element, μ represents the population mean, and the standard deviation is represented by σ. Moreover, it's necessary to understand how to interpret the Z-scores. By conceding the following:

- Starting by if the Z-score is less than a (0) so then the element less than the mean.
- Then leading to if the Z-score is greater than a (0) so then the element greater than the mean.
- Also, if the Z-score is equal to a (0) so then the element equal to the mean.
- On the same hand, if the Z-score is equal to a (1) so then the element that is a (1) standard deviation is greater than the mean; a Z-score is equal to a (2), this is how a (2) standard deviations are greater than the mean; etc.

Table 1. Z-score ETSIINF

ETSIINF			
Criteria	**Video**	**LEGO®**	**Difference**
Time consuming	0.19	–0.19	0.38
Ability to answer	0.09	–0.08	0.17
Engagement	–0.23	0.25	–0.48

Table 2. Z-score ETSIAE

ETSIAE			
Criteria	**Video**	**LEGO®**	**Difference**
Time consuming	–0.20	0.22	–0.02
Ability to answer	0.21	–0.21	0.42
Engagement	0.17	–0.15	0.32

- If the Z-score is equal to a (–1) so then the element that is a (1) standard deviation is less than the mean; a Z-score is equal to a (–2), this is how a (2) standard deviations are less than the mean; etc. [10–12].

Moreover, this is the part of calculating the Z-Score. As it can be seen in (Tables 1 and 2) that was obtained by analyzing and calculating the Z-Score of the first and the second sample of the experiment at ETSIINF and at ETSIAE. It can be seen that it has been divided into three score sections: ''Video'', ''LEGO'' and ''Result'', where ''Result'' is the difference between ''video-class'' and ''LEGO® SERIOUS PLAY®'', scores.

The following represents the analysis of the Z-score calculation at ETSIINF and ETSIAE. But first, it is very important to understand and explain the use of each criterion and what they are representing? Here is a brief explanation of the meaning of each criterion:

- ''Time-consuming'': An exact value of (0) indicates that the task proposed in each ''video-class'' and ''LEGO® SERIOUS PLAY®'' tasks were completed as the planned time. ''Positive'' value means that for some students completing the task took more time during the planned time. ''Negative'' value means that there were students that completed the task earlier than the proposed time.
- ''Ability to answer'': An exact value of (0) tells us that there is ''no change'' in the learner performance ''Behavior'' during each ''video-class'' and ''LEGO® SERIOUS PLAY®'' tasks compared to traditional classes. ''Positive'' value indicates a better learning performance ''Behavior'' and problem-solving. A ''Negative'' number indicates a worse learning performance ''Behavior'' and problem solving compared to a traditional face-to-face class.
- ''Engagement'': An exact value of (0) indicates that there is ''no change'' in how the students engage and participate in each ''video-class'' and ''LEGO® SERIOUS PLAY®'' tasks compared to traditional classes. ''Positive'' value means that the students participate more actively during the face-to-face class. ''Negative'' value indicates a worse rate of engagement than in traditional face-to-face classes.
- ''Observation'': The average score of ''LEGO® SERIOUS PLAY®'' task from the first sample of the experiment was (7.58) against the ''video-class'' task average score that was (7.69) as reviewed in the ETSIINF analysis report. Even though, if the averages are quite similar, in general, ''LEGO® SERIOUS PLAY®'s'' obtained better scores than in the ''video classes'' task. However, three students have graded the task with the lowest score possible, which explains the negative drop of the Z-score in the ''LEGO® SERIOUS PLAY®'' case, where it is noticeable in the ''Ability to answer'' criteria (Fig. 3). However, the ''Observation'': The average score of ''LEGO® SERIOUS PLAY®'' task from the second sample of the experiment was (5.33) points out of 10, against the ''video-class'' task average score that was (7.2) points out of 10as reviewed in the ETSIAE analysis report. Even though, if the averages are not similar, ''LEGO® SERIOUS PLAY®'' doesn't obtain better scores than in the ''video classes'' task. However, most of students graded the task of ''LEGO® SERIOUS PLAY®'s'', by a low score, even though they behave better during the experiment, which explains the positive rise of the Z-score in the ''LEGO® SERIOUS PLAY®'' case, where it is noticeable in the Fig. 4.

3.3 Q Factor Analysis Results

The Q methodology has been used to recognize different opinions and 'points of view' around an individual topic [13]. In order to measure the hypotheses, it must be said that one of the main features that are recommended to different kinds of researchers who have qualitative interests in human behavior is Q Mythology. Where it provides the basis for the methodical study of subjectivity [14, pp. 24–28]. Moreover, it helped to understand the different answers of the students based on their personal opinion and the way they responded regarding the experiment topic [15, p. 449]. In this section where both experiments (''video-class'' and ''LEGO® SERIOUS PLAY®'') are compared to both samples from both Technical Schools ETSIINF and ETSIAE. Furthermore, to analyze

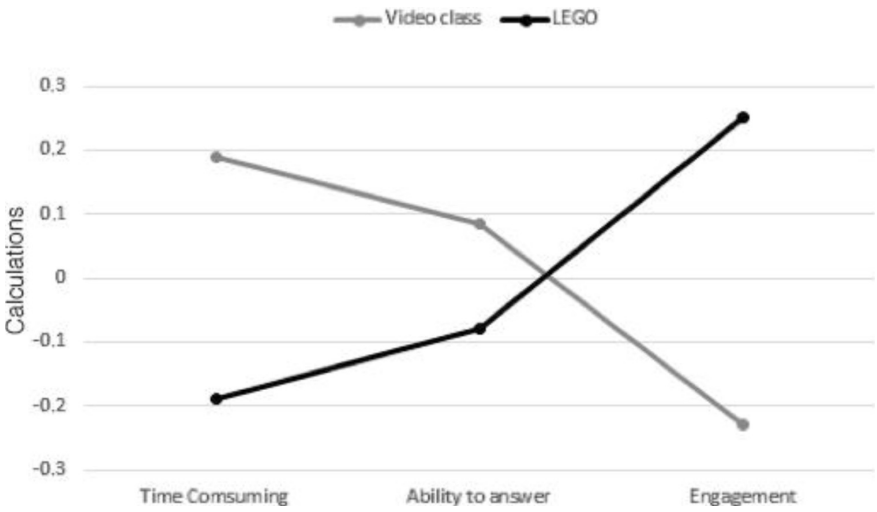

Fig. 3. Z-score calculation for ETSIINF.

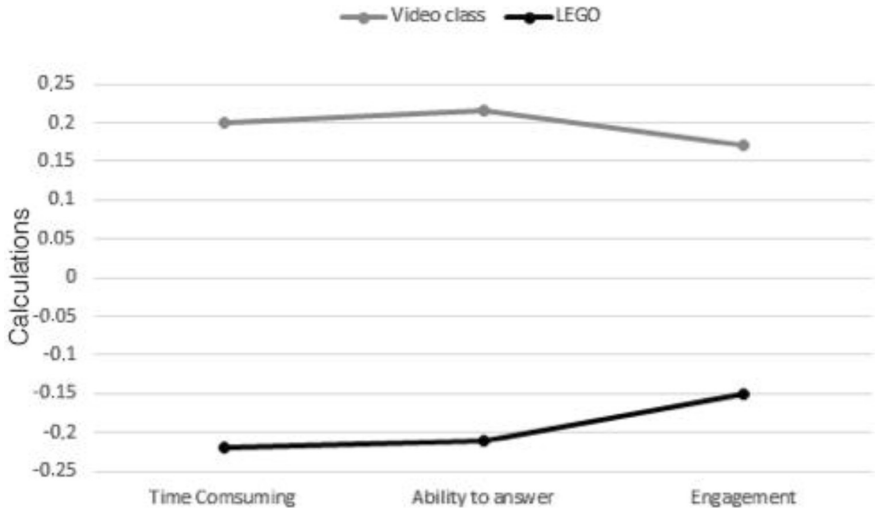

Fig. 4. Z-score calculation for ETSIAE.

the results of ''video-class'' and ''LEGO® SERIOUS PLAY®'' from the first and second samples of the experiment. As it can be seen at Fig. 5 below merges the ''video-class'' results, and Fig. 6 merges the ''LEGO® SERIOUS PLAY®'' results. This time, it is obvious that both graphs are showing how in both Schools the ''Completion rate'' is quite similar, where only a few percentages of students left before completing each ''video-class''. As for the ''video-class'', the ''Time consuming'' used to complete the experiment was similar in both cases, but the results and ''Engagement'' obtained are notably better in at ETSIAE than in the ETSIINF, where the reason behind this is that the students of ETSIAE were more technical and self-individual kind of students than the students of ETSIINF, where they tend to be more practical and logical kind of students. More to be discussed in the discussion section. However, as for the ''LEGO® SERIOUS PLAY®'' results, in both cases, the ''Time consuming'' used to complete the class was similar as well, but this time the students needed an extra time to finish the whole designing ''LEGO® SERIOUS PLAY®'' task. Despite that, the learner ''Behavior results in the case of the analyses of these both samples have better Z-score in the ETSIINF than in its results in the case of the analyses of these both samples at ETSIAE. This translated into a kind of more motivated and active students where they were more open to teamwork and creativity in reaching knowledge and interactive kind of learning process such as ''LEGO® SERIOUS PLAY®'' methods. Where it is more important than plain individualism learning.

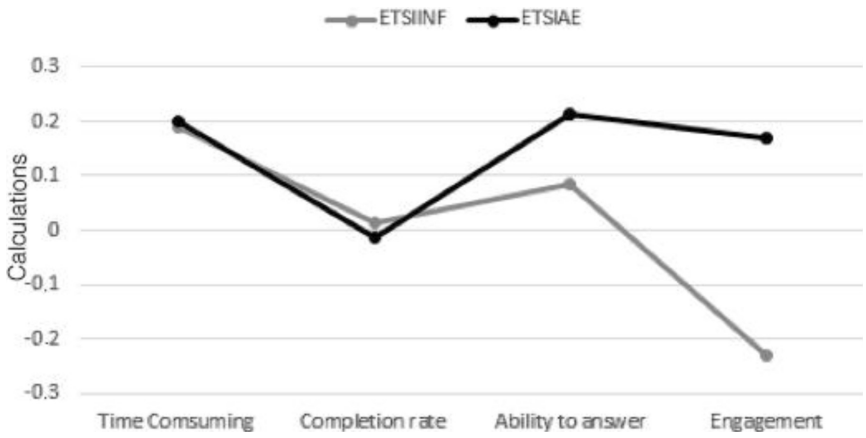

Fig. 5. Q factor calculation for "video-classes".

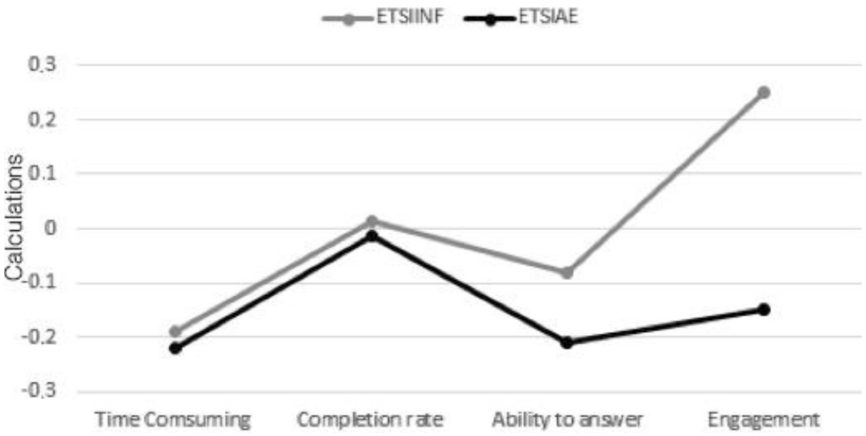

Fig. 6. Q factor calculation for "LEGO® SERIOUS PLAY®

4. Discussion

The objective of this experiment was to improve the quality of teaching that is reflected in the learner's behavior enhancement with innovative educational materials and resources through gamification techniques. So, the expected learning results regarding technical competencies are acquired by the student for better success rates, performance and behavior compared to old teaching methods. Moreover, in order to enhance the quality of the learning process, the experiment was designed for leading to capture quality attributes by deeply understanding the behavior of different learners during the performing task. The goal has been achieved by measuring the changing of the learner behavior in order to answer the following question "Does the changing of learner behavior affect the quality of the educational material in higher education?". In the same context, the process of learning was improved and measured the changes in the behavior of the learner. In this case, the students have solved the given task successfully according to requirements and design. However, the "video-class" class had some limitations to the kind of the presented content of the used material for deeper understanding and to the design of the visuals that been used in the video such as graphs, charts, exercises, etc.

4.1 Comparison between ETSIINF and ETSIAE

For the comparison of both Technical Schools (ETSIINF and ETSIAE), both samples of the experiment used the method of "Q Factor". Where Q Factor analysis is a technique usually used by the researchers to understand the method of categorizing users based on their way of responses and personal opinions on a defined topic [16, p. 505–530]. In a Q-Factor analysis, collecting the necessary data is simple and relatively easy, as various sources can be used such as interviews and surveys, and help us to analyze more precisely groups of people instead of individual items. When analyzing the collected data, a Z-score measurement helps to categorize different personal responses that show all kinds of participants, where in this case it is very important to shape

data's analyzing results visually to observe the change of learner's behavior. Moreover, this part is about the criteria that have been followed during this experiment. For the study of the Q Factor, five criteria have been used to analyze the learner behavior in both samples of the experiment, which includes both Technical Schools:

1. Time Consuming: This criterion shows how much time it was needed for the students to finish the task/s proposed in each class.
2. Completion Rate: This criterion shows how many students participated in each experiment, and also how many lefts before the completion of each class.
3. Ability to Answer: This criterion shows the approach that each experiment takes to help the students to answer, solve problems and learn.
4. Engagement: This criterion indicates the level of engagement shown by the student in each class.

Finally, the last part of this work was focused on the fifth criteria: ''External Observation'', which describes the attitude of the participants during each experiment. The criteria have reviewed based on the student responses and analyzed to get a complete knowledge of the students' behavior during the whole experiment based on an ''External observation'' of the whole process. On the same page, regarding both samples, we must take into account that during the ''video-class'' task, the students were not shown much active behavior by being serious and not very entertained, some were using their mobile phones, distracted or not paying attention to the content. However, for the students of ETSIAE, all the students have been working and learning individually by themselves as they are familiar with such learning methods that come back on the more technical and individual approaches during this type of learning. However, during the ''LEGO® SERIOUS PLAY®'' task, the same group of students thought that even if this kind of class is more entertaining, interactive and creative, it doesn't give them the proper required knowledge to their profession, which is more technical and mathematical. On the other hand, in the students of ETSIINF counterpart, the ''LEGO® SERIOUS PLAY®'' class was, in general, more successful. This kind of students made a better result by using this kind of creative learning, as it can be seen during the change of their'' Behavior'' during the ''LEGO® SERIOUS PLAY®'' class, where they were way more interested, interactive and participating, working as one group for a better visual solution. Also, the reason behind this might be due to the creative atmosphere given by the teacher in such methods, where the students were more relaxed and have the ability to create solutions from their imagination. During this research work, we contributed with solutions, designs, and results in the main contribution of enhancing and enrich the process of learning. By improving those process of learning we succeeded to achieve the main goal of changing the learner's behavior as the following:

1. The first contribution was to promoting the better reputation of applying gamification on OER courses.
2. Second, from the performed experiment we gave the engineering students an equivalent opportunity for sharing their vision contribution of different ideas in the same purpose with an intended to have better success rates, building skills, performance, and engagement.
3. Third, the designed visual task by using LEGO® SERIOUS PLAY® as an exploration tool has provided the learner with a deeper understanding learning method of the contents of the used educational material.
4. Fourth, capturing five quality attributes by studying the behaviour of different learners while performing the visual task, where it measured the change in ''Behaviour'' by different quality metrics.

On the other hand, and from the case study of Improve Product Development Planning by Providing Tools to Visualize Assumptions Behind Software Development that we have mentioned during the overview section. After collecting the data to be analysed and the result to be observed of the two workshops. Some of the observations during the experiment are the following: The participants stayed focused on solving the tasks, Lego bricks were a very useful tool for presenting ideas, where it kept them visually active, Most of the participants were familiar with Lego and they started building directly, and It was very easy to get the participant's attention to explain to rules. There was an atmosphere of excitement between the participants. However, even all of them gave positive feedback, only one of the participates didn't like the whole idea of using LEGO® SERIOUS PLAY ®. Even though, after the workshop, the product development team was ordered for another workshop.

As we can see from both experiments that the use of LEGO® SERIOUS PLAY® and Lean Canvas can help to have a shared understanding. Furthermore, as Lean canvas helps to describe the business model of a product. Where it has parts for solving problems, solutions, and alternatives. However, the size of the canvas does not help the participants to write everything they want to write due to the size of such a design. On the other side of the road,

LEGO® SERIOUS PLAY® is more flexible and open to new ideas and it's easy to adapt the model design with its brackets. This is how the visualization and the level of imagination are increasing with the use of such methods depending on different given challenges. During the studied workshops, the concept plan of working was to start from a smaller object until a bigger high-level designed vision. For this kind of approach, the challenges with low-level were not planned systematically. The developers planned systematically the high-level challenges that they felt were very important to work on. Finally, the main goal and benefit of this study were to explain to the participants how the method is used and how to create solutions to such complex challenges by using LEGO® SERIOUS PLAY® and Lean canvas [17].

As the purpose of this paper was to increase the level of quality of teaching through new techniques based on gamification strategy so that the student acquires the expected learning results regarding technical competencies as well as common transferable skills. This has been done through integrating gamification methodology to different educational material in order to level up the way the knowledge is presented and explain it in a more interesting way that catches the learner's eyes and engages him in the model of learning. Gamification methodology is an innovative process designed to enhance learning techniques and knowledge delivery [18]. Also, it is an application of learning by visual material that offers a facilitated problem-solving process, team working, time management, in which learners are led through a series of questions, explore deeper into understanding the subject. This is the way we used gamification methodology for gamifying the educational materials that have been used such as "Business Modelling" and "Aerospace" classes. From the case study we mentioned and from the experiment we performed, it is very clear that the use of LEGO® SERIOUS PLAY®, Business model Canvas, and Lean canvas are very effective tool to enhance the quality of educational materials [19]. As we can see the similarity in the goal of using such methodology to provide an effective, creative, and useful learning tool for the learner's own assessment in a way of contextualizing their learning.

5. Conclusion

As a brief summary and in short, the objective of the work is to address the question; Does the change of the learner behavior affect the quality of engineering education?. It was clear from the results of both samples the "LEGO® SERIOUS PLAY®" class was more oriented into the creative part of the knowledge acquirement. But, the "video-class" class had some limitations in the kind of used tools to explain the educational materials of the OER course as it was explained in the section of dissection. This is why, the students of ETSIINF that been interviewed they were very pleased of the experiment in general, very happy with the "video-class" given task as a typical tool of learning but more impressed with the results of the "LEGO® SERIOUS PLAY®" given task as they had the chance to use their imaginations and roles in the teamwork. Furthermore, sensing that the students were very happy to be involved in such a task and willing to learn more classes using "LEGO® SERIOUS PLAY®". On the other hand, the students of ETSIEA that been interviewed were fine and pleased of the experiment in general. However, sensed that the students were happy with both "video-class" and method used in "LEGO® SERIOUS PLAY®" given task. But, most of them preferred the normal face to face classes where they also prefer the traditional class where the teacher explains the contents. This is because, the students of ETSIINF had the chance to use imaginations on the task to create a new business plan for a music store but the students of ETSIAE were dealing with numbers, equations, and calculations where they are less chance to use imagination.

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