

GAIA ABSTRACTION GAME: A GAME TO ASSIST THE PROCESS OF LEARNING OBJECT ORIENTATION

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ABSTRACT

Given the difficulty of understanding the concept of Object Orientation in turning something from the real-world in object, differentiating what object class and object is, which is to instantiate an object, this article proposes a possibility to facilitate the teaching-learning of this paradigm. It was created so the game *Gaia ABstraction Game* contributes to this learning in a dynamic and attractive way. This article is based on research by authors who discuss the importance of games as a mechanism to facilitate learning. The main contributions of this article is: highlight that the game *Gaia ABstraction Game* may be important in the wake of student interest; make lessons interactive, dynamic and attractive; create a rewarding and attractive environment, serving as a stimulus for the whole development of the student.

KEYWORDS

Games, Cooperative Game and Object Orientation

1. INTRODUCTION

One of the biggest problems encountered by students in understanding the paradigm of Object Orientation is that they fail to understand some basic concepts, such as objects, abstraction, object classes and the association between object classes. These concepts are critical to the development of software, since the vast majority of programming languages and modeling is based on the paradigm of Object Orientation. This paradigm is considered by many professionals somewhat complex and difficult to understand. Because it is a paradigm that works a lot with abstraction and classification of objects, it's not always clear from the students this concept (Guedes, 2009). Thus, mechanisms to facilitate such learning is necessary in order to help both teacher and student, making lessons more objective, interactive, attractive and dynamic, and breaking the current paradigm of lectures, which are performed starting from a model ready.

The difficulties presented by students in the discipline of software modeling motivated the search for a mechanism that would facilitate the learning process of Object Oriented, so this article focuses on the theory of meaningful learning (Ausubel, 1980). As a mechanism to facilitate this process, we used the game as a tool to assist and understanding of Object Orientation, thus strengthening mutual cooperation among students. As a case study, we applied the game in the classroom and analyzed through the use of quantitative questionnaire of the students.

This article is structured into the following chapters: Chapter 2 presents the theoretical approaches that will be used in this article; in Chapter 3 discusses the use of the game in Object Orientation; Chapter 4 is about the case study with the application of the instrument; in Chapter 5 was made the closure of the study case with the results; and finally Chapter 6 presents conclusions and future work.

2. THEORETICALLY GROUNDS

2.1 Meaningful Learning

With the rampant growth of social networks and the development of new technologies, the current model of learning is no longer adequate in order to attract and motivate students in understanding the concepts of certain subjects. A major shift has occurred in creating, building and modifying the way in which we learn.

Second (Santos, 2012), the model of learning that supports our current needs is no longer the traditional model that believes that the student should receive the information and merely be ready, as the only task is to repeat the information in its entirety. The promotion of meaningful learning is based on a dynamic model, in which the student is taken into account, with all their knowledge and mental interconnections.

Learning (Ausubel, 1980) can be processed between the extremes of rote learning and meaningful learning. Rote learning is related to the learning of new information, with little or no association to any relevant concept in a student's cognitive structure, which simply receives information and stores it so that it remains available for a certain period of time.

As for (Poza, 2002) the process of trying to assimilate or understand new situations, it is not only a growth or expansion of such prior knowledge, but also a consequence of these imbalances or conflicts between prior knowledge and new information.

Meaningful learning, which is based on existing information in cognitive structure, is considered by Ausubel as anchor or subsumption. The subsumption is a specific structure whose information can be integrated into the human mind, which is highly organized and holds a conceptual hierarchy that stores previous experiences of the student. Thus, the new information can interact, contributing to the transformation of knowledge into new knowledge dynamically, but related between the new information and relevant aspects of the individual's cognitive structure. In other words, it can be said that learning occurs when significant new information is anchored in the relevant pre-existing concepts in the student's cognitive structure.

2.2 Games

The game means fun, frolic and it is taken as a resource capable of promoting an environment planned and motivating, enabling learning various skills. Thus, students with learning disabilities can take advantage of the game as a means of facilitating comprehension.

For (Freire, 1989), in the context of school education, the proposed game as a way to teach students content is very close to the work. This is not a game anymore but a game processor in a pedagogical tool in a teaching medium.

Second (Jesus, 2010), so that the game can be useful in the educational process, it is necessary to take into account certain aspects such as: "allow the student can also evaluate their performance, promote active participation of all players and be interesting and contain challenges".

2.3 Cooperative Game

Cooperative games are by essence stimulate competition, but never neglect the mutual cooperation between participants. Cooperative games create an educational effect, to teach the youth that winning or losing does not matter, the important thing is to get everyone to work towards an objective.

Second (Correia, 2006), play is an activity that provides constant and dynamic situations which stimulate creativity and expressiveness of the young, whereas cooperation refers to the involvement and participation of young people in games, showing increased collaboration, solidarity, friendship and respect among participants.

(Amaral, 2004) considers that cooperative games are activities that require teamwork in order to achieve mutually acceptable goals. The cooperative game seeks to harness the conditions, capacities, qualities or skills of each individual and apply them to a group trying to achieve a common goal. The most important is the collaboration of each, is what each has to offer at the moment, so that the group can act more efficiently on the given tasks.

3. APPLICATION OF GAME IN LEARNING OBJECT ORIENTED

Inherently, the game at its core brings mechanisms to foster an environment that enables planned and motivational learning of various skills, adding these features to the particularity of cooperative games, which have as their principal, a mutual cooperation among its participants. Placed in the context of meaningful learning, the game becomes a major tool in the development of knowledge. This context has enabled the creation of the game *Gaia ABstraction Game*, which includes all of these features, and can be used for facilitating the teaching-learning tool of Object Orientation.

The game *Gaia ABstraction Game* attempts to interactively and objectively transform the lessons in a classroom into a more dynamic and attractive setting. Allowing the teacher to transmit the contents of Object Orientation in a practical way, there's no way for it to exist only in theory, the student begins to view such content in a practical and objective with examples that will be used in your day-to-day as a software developer.

The game is divided into eight stages, each stage of the game has a specific objective in the knowledge of Object Orientation, which includes this; abstraction of objects, creation of classes of objects, the definition of what an object is, the definition of relationships (inheritance, composition and aggregation) of classes and the cardinalities of relationships and relationship *stereotypes*. For the game to contemplate all these features, it created a mechanism composed of cards and a board.

Business-Cards are divided into seven businesses (software requirement to be developed). For every business, there is a brief description of the requirements that make up the business in question and which are necessary for the development of the business. These business letters are intended to show students that it is not possible to develop software without knowing the rules of business, that no possibility of creating classes and relationships without knowing where it will be applied.

For each business can be developed, maps were created to represent each class of objects (mold) game cards that are considered the initial object of the game working *Gaia ABstraction Game* because it is through them that the student is able to identify several factors related to Guidance Object. The teacher and the shuffles in a row, distributes to students. At first the teacher should deliver only one letter per student so that the student does not have the opportunity to choose it, since one of the main features of the game and the integration of students in class, and that this choice would take this characteristic. Figure 1 Cards of the game *Gaia ABstraction Game*.



Figure 1: Game cards.

After the distribution of these cards, and the teacher reading each card of the corresponding system, students should locate their workgroup which is another important feature of the game *Gaia ABstraction Game*. Due to the fact it's a group game, the scores of the game refer to work within groups, thus providing mutual cooperation among the participants, and also helping in the teaching-learning process, as students who have more ease with the Object Oriented paradigm can assist their colleagues in this learning process.

When meeting their working groups, students must abstract (describe) their cards, the characteristics (attributes) and actions (methods) that each object class has. Thus, the student can already visualize and differentiate what an object class (template) of an object (something that was substantiated from this class of object) is, which is already a major breakthrough in the process of understanding the concept of Object Orientation. In the theoretical lectures not always is the concept clear to the student. With game *Gaia ABstraction Game*, the student can also view and understand the concepts of association (relationships) and cardinality (how many times a class is related to another), achieving implementation and understanding the importance of these concepts in practice during the phases of the game.

4. CASE STUDY

As a way to verify and validate the application of the game in the teaching and learning of Object Orientation accomplished an application in the modeling of software in two stages: at first, the students understood what it meant for each business to be modeled, formed working groups and abstracted each class of objects, "letters" on a piece of scrap paper, the second time, the students set up the classes of objects in the trays and held their proper association with the definition of cardinalities and the *stereotype*.

The classes were taught in three classes of the computer technician on the internet, having been initially attended by about 50 students, between the ages of 15-18. The methodology used to teach the classes was to lecture on the concepts of Object Orientation.

The class began by explaining the concepts of Object Orientation, with emphasis on the construction of classes of objects (abstraction, object, class, attributes, relationships and so on.). After the explanation of the concept, generally left to the explanation of the game: rules, how to play and goal of the game, from this moment, the game was applied to students in order to fix the concepts in a practical and objective way. Each time the game took about 1 hour and 20 minutes, and during the game, some doubts have arisen by the working groups and remedied by the teacher.

As a means for proving the improvement of teaching-learning paradigm of Object Orientation, we used a quantitative questionnaire which, by its own features has the advantage of speed and may include the views of all students who participated in the game. At the end of the game we asked the students to fill out the questionnaire, comprising 15 questions, aiming to demonstrate the degree of contribution to the game *Gaia ABstraction Game* brought to the student.

5. RESULT

According to the analysis result of the opinion of the students submitted the questionnaires, it is possible to conclude that the use of game *Gaia ABstraction Game*, in a preliminary analysis, means and contributes positively to the understanding of the concepts of Object Orientation. Importantly, most of the students who participated in the study considered the game a positive contribution.

At this moment the instrument was administered to students at the technical level who had had contact with the Object Oriented paradigm to analyze the degree of contribution that the game provided.

By questioning students who had contact with game *Gaia ABstraction Game* on which the contribution was in the process of teaching and learning of Object Orientation, of the 49 students surveyed, 47% responded that the game contributed fully, and 51% responded that the game contributed partially, and 2% chose not to respond.

In the present study, in questions 6, 8, 10 and 12 dealing with the contribution of the game *Gaia ABbstraction Game* in aiding the learning of basic concepts: what is abstraction, object, class of objects and relationships. The figure show how the vast majority of students responded that the game contributed fully or partially with learning. See the graph in Figure 2.

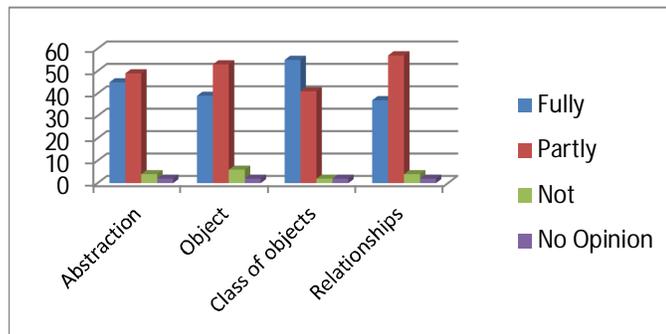


Figure 2: Histogram Issues 6, 8, 10 and 12.

6. CONCLUSIONS AND FUTURE WORK

One of the main difficulties in computer courses - mainly conceptual in disciplines such as: software modeling, theory analysis and design of database - is to ensure the motivational factor for the students. Students, who enroll in these courses, bring along a mentality of work and study based on repetition and memorization of concepts and content, without the worry of abstracting the knowledge required in solving problems.

With the attempt to awaken the motivating factor, and stress the importance of studying these disciplines by students, it is proposed to use the game as a facilitator of learning methodology of these disciplines.

Thus, this article contextualized throughout its development games that have already been applied in other areas of education, highlighted the importance of cooperative games and meaningful learning, and finally, to facilitate the strategy, it was implemented the construction of a game with practical scenarios used mostly in the concept of Object Orientation. These aspects could be practiced in the construction of each business model by students. Within this context, the use of the game provided demonstrate step by step how to draw the class diagram, and relate the concepts of Object Orientation in building a system.

With the results obtained by means of student questionnaires, it was noticed that there was a significant improvement in learning Object Orientation, which leads us to believe that the game *Gaia ABstraction Game* can be a powerful tool in the construction process of the teaching-learning Object Orientation. Unquestionably, there is still the need to apply the game to more students, and students at the undergraduate level, aiming a result more consistent and comprehensive. However, it was possible to make an initial evaluation of productivity in student learning with the use of the instrument in question.

As next steps, it is expected to develop a mechanism to facilitate the implementation of the object classes modeled during the game in executable code in programming disciplines, or even that these modeled objects can contribute in a way to integrate various disciplines.

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