Interdisciplinary Project for Teaching Digital Games by Logic Board Games

Vinicius G. de Mendonça Kelly C. Landolfi Bettio Artur Mittelbach Fabio V. Binder
João Coelho Neto* Andreia Malucelli Sheila Reinehr

Pontifical Catholic University of Paraná (PUCPR), Curitiba, Brazil
* Universidade Estadual do Norte do Paraná (UENP), Cornélio Procópio, Brazil

Abstract

This paper describes an interdisciplinary project as an educational experiment aimed to integrate three game development related disciplines by implementing a digital version of a board game as a motivator to the process. It presents the views of Game Design, Game Workshop and Game Project disciplines, as well as the obtained results and lessons learned which may contribute to related and future work.

Keywords: digital game, board game, education, interdisciplinary.

Authors' contact:
arturfm@gmail.com
{vinicius.mendonca,kelly.bettio,
fabio.binder, sheila.reinehr}@pucpr.br
joaocoelho@uenp.edu.br
malu@ppgia.pucpr.br

1. Introduction

The usage of games in education, as a pedagogic proposition demands a very broad educator formation, since the educational process is not resumed to computer or software manipulation, but a tool to help him to develop knowledge the proposed subject and how this machine will help him integrate knowledge execution [Valente, 2011].

Besides, the usage of games in education allows this media resources to send information to the student and help him building the knowledge in which he is involved.

Corti [2005] addresses that games create an environment in which users learn to explain, describe, build, compare, analyze, access and evaluate. Games allow players to share experiences in a cognitive, emotional, psychological process, by means of narrative histories, drama, humor and character development.

Also, the cyberspace allows the combination of several communication ways, with increasing complexity like: e-mail, video, conference, social games, shared hypertext and advanced learning or cooperative work environments, that is, multiuser virtual worlds [Lévy 2007].

With the goal in mind of a multidisciplinary project to teach game development, we tried to analyze the board game influence as a motivator to electronic game development.

This paper is organized as follows: Section 2 describes the course proposal; Section 3 presents the interdisciplinary project and its participants view; Section 4 addresses and analyzes the obtained results; Section 5 presents the final considerations.

2. Course Proposal

The Electronic Game Technology Graduation Course of PUCPR started its activities in the second semester of 2010. Its main goal is to capacitate electronic game programmers to work in several platforms, like: desktop, web, mobile devices and consoles.

The course is divided into 5 action trails:

1. Game design, graphics and sound;
2. Humanization;
3. Mathematics;
4. Project and game programming;
5. Computer technology.

The first one has the objective of introducing development subjects of game development not related to programming and is composed of Game Design I, II and III, Digital Illustration, 3D Modeling and Sound Development. The second part is formed by mandatory PUCPR disciplines: Processes of knowledge, Philosophy, Ethics, Religious Culture and Community Project. The third part is formed by Mathematic disciplines, with the objective of creating a theoretical basis for game development. The fourth part is composed exclusively by game development disciplines for the previously indicated platforms.

Finally, in the fifth part, other general computation subjects are shown, like: Databases, Operating Systems, Computer Architecture and Networks.

3. Interdisciplinary Project

The idea beyond the integration project was to allow students to build a game using multidisciplinary knowledge. An average size project that composes the score of several disciplines also allows that the student use his available time more productively, focusing his efforts in one important activity.

Using board games as starting point for electronic games has several advantages: complete, solid and functional game rules; a turn based game allow students to focus in the interface and problem solving algorithms instead of animations which become

repetitive with no meaningful gain for the students learning process; motivation born from the development of the digital release of an internationally acclaimed board game.

The project was developed on the three disciplines: Game Design III, Game Project and Game Development. Each one emphasizing one of three different aspects of a game development process:

1. Game Design, in which jogability decisions are taken;
2. Game Project, where a technical solution or an architecture is created; and the
3. Game Development itself, where it is tested and distributed.

The figure 1 shows students preparing interdisciplinary project presentations.

Figure 1: Students in the Interdisciplinary Project presentation day.

3.1 Game Design III

Game Design III was the third game design semester of the course. By that time, the students were supposed to already have some fairly good understanding about the game designer role and how to structure a concept of a game.

In the previous semesters, some exercises were carried out involving the creation and analysis of board games. However, the students still could not see the potential to use the study of board games for creating future digital games.

Deciding to emphasize the relevance of those previous exercises, the students were asked to play a game of Carcassonne [WREDE 2000] on the very first class of the semester. None of the students had previous knowledge of the game and after about one hour of play they all agreed that the game was interesting and implementing an electronic version of it would probably be a good exercise.

The next step was to dismember the primary systems of the game: Turns control, Tile randomizing, Tile handling, Tile placement, Meeple assignment, Meeple management, Scoring (during the game), Scoring (end game). Then, the students started to realize that the game rules could be broken down into sub systems, and each system could influence one another.

The basics of the exercise, game design wise, was to read the rules, play the game and create a structured computational view of that game experience.

The students were asked to use the knowledge acquired at the Game Project course to create the game systems diagram so they could see those systems, determine it scope and plan the best ways to accomplish the task ahead.

The goals of the project for the Game Design course were:

1. Have a “non responsive” version of the game. That involved: the tile set collection according to the tiles from the original game, a shuffle mechanic to draw a tile, and a grid like system that the player could use to place his tiles. Although, for this version, all validation, meeple placement and scoring should be manually handed by the players, just like the actual board game.
2. Playtest the game interface, game feel, and analyze the possible improvements for the game.
3. Have the tile and meeple placements validation and scoring system implemented.

The first goal should be achieved by the end of the second month of the project. Then, playtest should be conducted and the second goal achieved. And finally the third goal should have another two month period to be completed.

3.2 Game Project

The main goal of the Game Project discipline is to give the students the knowledge about how to project an electronic game. Besides learning the Unified Modeling Language (UML), the discipline topics also includes electronic game life cycle study, analysis of each phase, agile development methods focused in XGD (eXtreme Game Development) and software estimates.

The integration project acted as a motivator for the Game Project discipline, since the audience of this course is student strongly focused in programming and with resistance in relation to documentation. Due to this, it is extremely important to use educational techniques that promote discipline interest and allow the assimilation of its content.

The students were asked to create an architecture document based in the Rational Unified Process (RUP).

This adaptation was made in order to let the document focus only on the necessary and sufficient topics in game development scenario, using as theoretical basis the subjects approached by Flynt and Salem [2005], and agile principles of development.

The architecture document was composed by topics like: Description of the Problem and Solutions, Functional and Non-Functional Requirements, Use Case Models (diagram and realization), mandatory UML Diagrams (activities, class, sequence and state machine), and optional UML diagrams used as needed (object, communication, component, package and

deployment). Choosing a board game permitted us to bring the game itself to classes in order to study its rules. In some cases, it was possible to execute some parts of the game in order to develop the logic that would be transferred to the diagrams.

It was possible to notice that real world object manipulation made easier the identification of attributes and operations used into the Class Diagram construction. The game play sessions using the board game allowed the construction of Use Case, Activities and State Machine Diagrams.

In the subject of sequence diagrams, the board helped to identify the frontier objects, demanding student understanding relative to the implementation that was used in Game Workshop discipline; a clear advantage of the Interdisciplinary Project.

Three students teams were formed and they remained the same in all disciplines in the project.

The final result exhibition was evaluated by four professors that questioned relevant project topics for approximately 40 minutes. After presentations, the professors gathered together, discussed their view point about each team, considering their final presentation and the follow-up through the entire semester,, than the final grade was computed.

3.3 Game Development Perspective

The students were requested to create a PC clone of Carcassonne game. That is, they had to create the art and code all Carcassonne logic in four months.

In terms of programming, challenges where rapidly identified by students early on the beginning of the semester.

The Carcassonne player may accommodate his tile at any of four the directions. This allows the board to grow in an undefined way until the game run out of tiles, and a rectangular data structure (like a matrix) could not represent a board like this satisfactorily.

The figure 2 shows a screenshot of the game that was developed to represent the game board.

Figure 2: Development of the board prohibition rule.

One of the main challenges faced by the students were: How to validate piece position, since not all pieces can be placed together and all pieces may rotate freely;

How to compute points, since Carcassonne rules needed to test closed areas like cities, roads (which may contain loops roads) and pieces with more than one element simultaneously (road plus grass in the same tile position).

Another challenge was to provide a good artistic representation of the game. How to indicate to the player how many *meeples* it has? How draw the pieces on screen and make them fit? And what command the player must do to scroll the screen intuitively? Finally, what kind of sound effects a board game should have?

4. Team Results

The two groups tried to align their strength with their vision of what they think should be achieved. While some team members were trying to define the systems of the game while others were already trying to implement the scoring mechanics.

The groups also avoided investing time in playtesting, and rather use that time to try to improve the game engine and systems. At the end of the project the lack of usability and playtest was pretty obvious.

Both groups were able to achieve the first milestone of having a ‘non responsive’ version of the game. The first two programming challenges where accomplished on schedule, and a fairly good game interface where presented in the middle of the semester.

By the time the two month milestone was reached, none of the teams had a playable version to be tested, and only then they started to realize that half of the time had already passed.

The first group tried to make a perfect game mechanics, including a good documentation, and sacrificed gameplay concerns.

The second group worried about graphical details and code embellishment and took too long to deal with the scoring representation.

Figures 3 and 4 show final screenshots of the game.

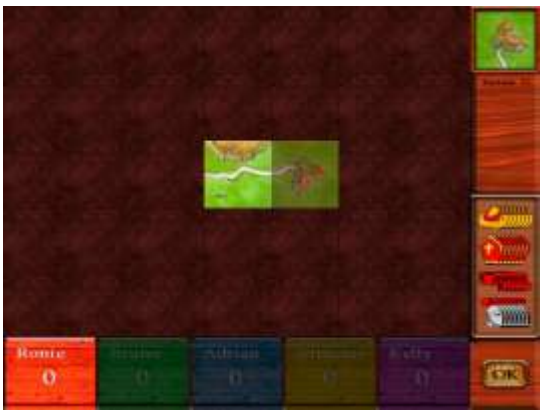

Figure 3. Screenshot of the game.

Figure 4. Screenshot of the game.

5. Final Considerations

This interdisciplinary project was the first medium size system developed by students and offered important lessons that are beyond the subjects in all disciplines individually: task and time division, activity prioritization, and the challenge of communication among all group members.

All these aspects have as a mandatory expected outcome: the fulfillment of all required functionalities within the timeframe.

Despite the apparent simplicity of the chosen game, some functionalities demanded special care in game design, project or construction.

The Game Project gave the main benefit of helping team members to divide their tasks.

Delivering the game demanded a thorough and careful programming of each functionality in order to achieve a result close to the expected in a complete product. In isolated disciplines, this completeness usually is not considered due to time constraints. In the integration project, some students were able to realize how demanding and hardworking is to craft all final the details a game need to have a chance of achieving success among players.

It was difficult to guide students by using UML as a support tool. The complex logic was focused in two or three functions that could hardly be broken into smaller classes.

Although the groups did not achieved all goals we evaluate the experiment as highly satisfactory. Some points observed during its interdisciplinary project were:

(i) Reusability: Part of the effort put in working for a discipline could be used by other. And this observation can be applied both from the perspective of students and professors;

(ii) Synergy: By using material from other disciplines in your own, one can create a very positive resonance to the educational environment. The scenario observed is that the students were carrying about not only the game design at design class, but also in Workshops and Project classes. The reciprocal was also true. The Game Design teacher observed the students talking about structural and executive issues as well. Students naturally start searching in the complementary disciplines how to address their problems, and they were oriented to discover the utility of a project plan in team work;

(iii) Integration: Both, professors and students were able to realize that create an integrated system (be it a classroom or a game) requires more effort than just enough to create the individual pieces. The duration, extent and the importance of the work gave tangibility to the need of a plan and process, like RUP or XGD. Using individual disciplines, this objective might not be achieved due to the fact that only a very specific software or document delivery is made. Using a multi disciplinary project the students had to organize their own process, in order to coordinate the work and provide all three discipline deliverables on schedule.

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