

Distance Teaching Game Development

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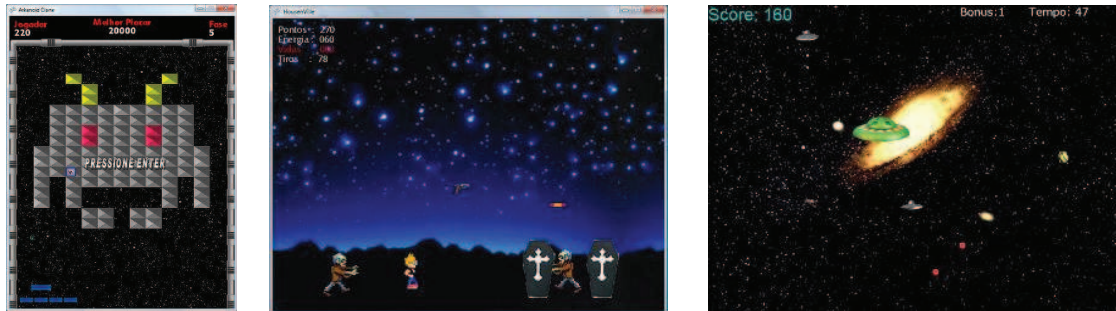


Figure 1: Example of three developed games - Arkanoid Clone (left), Housenville (center) and Zanac 2000 (right) developed by XNA students in the course.

Abstract

Web-based education is breaking the barriers of space and time by allowing the students to learn anytime and outside the traditional classrooms. The experience of distance teaching game development is yet a greater challenge to the instructor and the students as well. This paper presents the experience of accomplishing the first game course at Fundação Cecierj / Consórcio CEDERJ. It exposes the details of the used methodology and the results achieved in two ways: a satisfaction survey applied at the end of the course and the students developed games.

Keywords: distance education, game development, XNA, EAD, 2D games

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1. Introduction

Nowadays, most students have a busy life, splitting the daytime into several activities and having relatively short time available to learn in a classroom. Distance education comes as a great facilitator, by allowing the students to choose when and where they want to learn. E-learning of all types is growing as a dominant delivery medium for workforce learning [Clark and Mayer 2008; Bates and Bates 2005].

Teaching game development in a classroom is already a challenge. The students, mostly young and eager to learn, construct their games in the classes and present several problems when trying to execute their own games. These errors must be corrected as soon as

possible, so they do not interrupt their learning progress.

In Brazil, the game development courses are very recent. The first residential courses appeared around 2003. In 2004, the Brazilian Games Association (Abragames) was founded. Thereupon, the government and the Abragames encourage the game development activity and several game development courses were created [Silva and Santos 2006; Whitaker 2008].

The experience reported here is a very specific one and can be considered the first distance teaching game development course available. Moreover, the course was offered inside the Governance area of study, which certainly attracted a very diverse group of students, some of them even without technical background. The only requirement for this course was some knowledge about logics. This was a great challenge for both the students and the teacher.

This work presents details and results of this experience. In section 2, some related works are shown. In section 3, the details of the used methodology are discussed. Section 4 presents the results of a survey applied to students. Finally, section 5 comments the conclusions and propose some ideas for future works.

2. Related Works

One of the first Brazilian residential game development courses appearing on the Brazilian market was "Game Developer" of Technology & Training (T&T).

A methodology for developing 2D games in C++ language by using MRDX, SDL and NGL libraries,

respectively was shown by [Almeida 2004; Radtke 2006; Perucia et al. 2007].

Some guidelines about the tutelage in a game development process were presented in [Araújo 2006]. However, the details of the work were not listed.

A collection of techniques and tools used for 3D game development was considered in [Clua and Bittencourt 2005].

A video tutorial about the creation of the 3D game Guitar Matey, by using XNA is available in [Waters 2008].

However, none of those works were focused on distance teaching game development.

3. The Used Methodology

The course is named “Developing 2D Games with C# and Microsoft XNA”. It is a 45 hours e-learning extension course being offered by the Governance knowledge area, since the beginning of 2009. It is about to be included in an IT specialization course. The Governance area offers extension courses on management, auditing and information technology.

Fundação Cecierj is a governmental institution that offers free e-learning courses to capacitate teachers and professionals in several areas of knowledge.

3.1 The resources

The backbone of this course is the Moodle platform, used for all Cecierj e-learning courses. The Moodle platform is a free web application and provides a very good environment for e-learning courses. It offers an intuitive interface and a wide range of interaction options, like forums and chats. It is also completely customizable for the user, allowing the inclusion and modules arrangement, like news, content (rss and twitter) and many others.

This course was structured to provide two main learning options for the student:

- Visual and interactive content
- Textual content

Visual and interactive content is available by the use of Flash technology. This content can be visualized through a web browser after the installation of a Flash plugin. It is very attractive, because it presents animated sequences, images and a lot of interactions available for the student. There is also an animated robot character presenting the topics. Figure 2 shows this. The visual content is a compilation of information available inside the textual content of the course.

The textual content was produced according the e-learning standards established by Fundação Cecierj / Consórcio CEDERJ. These norms include:

- Presentation of the content in a clear, pleasant and objective language, to motivate the students to learn;
- Use of several reflexive and practical activities to fix the learning.

The course content was arranged into eleven weekly rate lessons. Each one presents the following resources:

- A visual file in Flash format;
- A text file in PDF format;
- Discussion forums about interesting themes on lesson content;
- Every week practical activity, to be concluded and sent to the instructor afterwards.

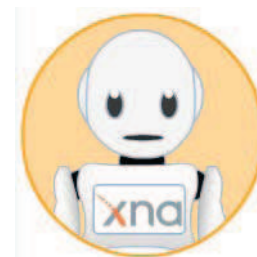


Figure 2: The XNA Robot

3.2 Evaluation

It is not enough to understand and learn a subject. To motivate the participation in forums and hold students in their activities, a grade is attained to each participation and activity execution. At the end of the course there is also a game project. It comprehends the production of a complete game that is built gradually during the eleven week activities [Alonso et al. 2005].

The formula for calculating the final grade achieved by the students is:

$$FG = GP + \sum_{n=1..11} (FP_n + WA_n)$$

Where “n” represents the week number, ranging from 1 to 11, “FG” stands for final grade, “FP” means forum participation grade, “WA” is weekly activity grade and “GP” is the game project grade.

The final grade is a sum of all forum participation, weekly activities grades and the game project. The student must achieve a minimum grade of 6 for approval. The maximum grade obtained by concluding each one of these tasks can be seen on the Table 1:

Task	Maximum grade
Forum participation	0.1 x 11 weeks = 1.1
Week activity	0.4 x 11 weeks = 4.4
Game Project	4.5

Table 1: Maximum grades for course tasks

3.3 The course weeks

The course is distributed into thirteen weeks. The last two are reserved for the conclusion of the game project.

The following resources are available for the students since the start of the course:

- Discipline guide;
- E-learning apprentice hints;
- Presentation forum;
- News forum.

Discipline Guide is an explanation of the course objectives and methodology. It also presents several rules for the students, including forum participation rules, minimum forum frequency for approval and the final grade formula.

E-learning apprentice hints is a small text guiding the student into organizing its studies and available time for a better course performance.

Presentation forum is the first forum of the course, created for integration of the teacher and the students among themselves.

News forum presents the last news concerning the flow of the course, like an interesting correlated event, extension of activity delivery deadlines and other important communications about the course.

3.3.1 Week 1: Getting familiar with the games

The first week of the course comprises the following resources:

- Course presentation, structure and navigation hints;
- Lesson 1: Getting familiar with the games – Flash and PDF content;
- Discussion forum about the use of games in education;
- Lesson 1 doubts forum;
- First week activity: Find a sample game from each learning category on the internet;
- Web bibliography.

Lesson 1 presents the history of games and the evolution of the game development industry through the time. It also explains the main characteristics that must be present in a game [Crawford 1982]. It shows a game classification method, called learning categories [Mcfarlane et al. 2001], which assigns the game into one or more learning categories by observing what kinds of knowledge it can offer for the game player.

The first week activity conducts the students to search for a game sample of each one of the eight presented learning categories and its objective is to consolidate the knowledge of the student about learning categories.

3.3.2 Week 2: Designing your game

The second week of the course comprehends the following resources:

- Lesson 2: Idealizing your game – Flash and PDF content;
- Discussion forum about which game developer professional role would you like to assume and why;
- Discussion forum about what kind of game you will create using XNA;
- Lesson 2 doubts forum;
- Second week activity: Idealize your own game and create a game design document;
- Bibliography.

Lesson 2 makes an overview about the tools used to create a game and show the guidelines to produce a short game design document [Silva and Rech 2004]. It details the main game development roles in a game development team as well.

The second week activity challenges the students to idealize their own game, by writing a game design document to specify the details of this game.

3.3.3 Week 3: Installing Visual C# and XNA Game Studio

The third week of the course includes the following resources:

- Lesson 3: Installing Visual C# and XNA Game Studio – Flash and PDF content;
- Lesson 3 doubts forum;
- Third week activity: Send a “Help/About” screen of the Visual Studio as a proof of software installation;
- Bibliography.

Lesson 3 discusses all the steps necessary to turn your computer into a game development machine. It covers the installation of Visual C# and XNA Game Studio and instructs the students to update their Windows versions with service packs.

The third week activity propose the students to install the Visual C# and XNA Game Studio tools on their machines and send a “Help/About” screen of the Visual Studio after software installation as a proof of completion.

3.3.4 Week 4: Creating the Spaceship Class

The fourth week of the course consists of the following resources:

- Lesson 4: Creating the Spaceship Class – Flash and PDF content;
- Lesson 4 doubts forum;
- Fourth week activity: Define your game classes.

Lesson 4 shows the object-orientation (OO) concepts of class, method and attribute and exemplifies the creation of a Spaceship game class by using the C# language.

The fourth week activity challenges the students to produce their own game classes (3 at least), based in the game design document they produced in the second week activity.

3.3.5 Week 5: Starting a XNA Game Project with Visual C#

The fifth week of the course comprises the following resources:

- Lesson 5: Starting a XNA Game Project with Visual C# – Flash and PDF content;
- Lesson 5 doubts forum;
- Fifth week activity: Create your own game project.

Lesson 5 exhibits a tutorial for creating your own XNA game project with Visual C#. Moreover, it explains some details about C# reserved words and the use of software libraries. Some syntax of XNA commands is also addressed and the four main XNA game project methods are explained in detail.

The fifth week activity invites the students to produce their own game project, including inside it the classes they created in the last week activity.

3.3.6 Week 6: Showing and Moving your Spaceship

The sixth week of the course comprehends the following resources:

- Lesson 6: Showing and Moving your Spaceship – Flash and PDF content;
- Lesson 6 doubts forum;
- Sixth week activity: Add textures and mobility to the characters of your game project.

Lesson 6 instructs the students to assigning textures and mobility to the objects composing the game project. In addition, it addresses the texture and spritebatch concepts.

The activity of this week conducts the students to incorporate textures and mobility to the objects present in the game project created in the previous week activity.

3.3.7 Week 7: Incorporating Shots and Spatial Scenery to your Game

The seventh week of the course includes the following resources:

- Lesson 7: Incorporating Shots and Spatial Scenery to your Game – Flash and PDF content;
- Lesson 7 doubts forum;
- Seventh week activity: Incorporate shots and a moving scenery to your game.

Lesson 7 reveals the concept of object lists and demonstrates how to create and control a list of shots fired by a spaceship inside the game. Further, it explains the details about game background sceneries and how to move them inside the game.

This week activity encourages the students to incorporate a list of objects and background scenery to their project, updated in the last week activity.

3.3.8 Week 8: Playing Sounds in your Game

The eight week of the course consists of the following resources:

- Lesson 8: Playing Sounds in your Game – Flash and PDF content;
- Lesson 8 doubts forum;
- Eighth week activity: Create a sound project and add it to your game project.

Lesson 8 instructs the students how to manipulate the XACT - XNA Audio Creation Tool for creating sound projects for XNA games. Besides, it describes how to incorporate these sound projects into the game project and effectively play the sounds.

The eighth week activity challenges the students to create a sound project and incorporate it in the game project updated in the seventh week activity.

3.3.9 Week 9: Dealing with Object Collisions in your Game

The ninth week of the course comprises the following resources:

- Lesson 9: Dealing with Object Collisions in your Game – Flash and PDF content;
- Lesson 9 doubts forum;
- Ninth week activity: Add a collision treatment for the objects of your game project.

Lesson 9 presents the object collision concept and shows how to check simple and advanced collisions occurring between game objects.

The ninth week activity induces the students into adding a collision treatment to the objects of their game project, updated in the former week activity.

3.3.10 Week 10: Creating Persistent Effects (Explosions) in your Game

The tenth week of the course comprehends the following resources:

- Lesson 10: Creating Persistent Effects (Explosions) in your Game – Flash and PDF content;
- Lesson 10 doubts forum;
- Tenth week activity: Incorporate a persistent effect into your game project.

Lesson 10 instructs the students about persistent effects and time management within the game. It exemplifies the creation of an explosion effect in the game when an enemy spaceship is hit by a player shot.

This week activity propose the students into adding one or more persistent effects into their game project updated in the previous week, according to the game design document produced in the second week activity.

3.3.11 Week 11: Making Enemy Spaceships Smarter

The eleventh week of the course includes the following resources:

- Lesson 11: Making Enemy Spaceships Smarter – Flash and PDF content;
- Lesson 11 doubts forum;
- Eleventh week activity: Programming the intelligence for the enemies;
- Game Project activity: Create a complete game based in your game design document and the completed week activities.

Lesson 11 explains the concept of artificial intelligence (AI) and gives three examples of AI use to enhance the behavior and reactions of the enemies present inside the game.

The activity of the eleventh week invites the students into adding some intelligence to the enemies created in their game project, updated in the last weekly activity.

Game Project activity challenges the students to finish their own complete game, based in their game design document produced in second week activity and the game project updated current weekly activity.



Figure 3: Student XNA game - Reino da Magia

3.3.12 Weeks 12 and 13: Finishing your Game Project

The weeks 12 and 13 are intended to give some time for the students to complete their game project. By the end of the week 13, they submit their final work for evaluation and their final grades are calculated. Figure 1 and Figures 3-9 show samples of games developed individually by students.



Figure 4: Student XNA game - BATlantico

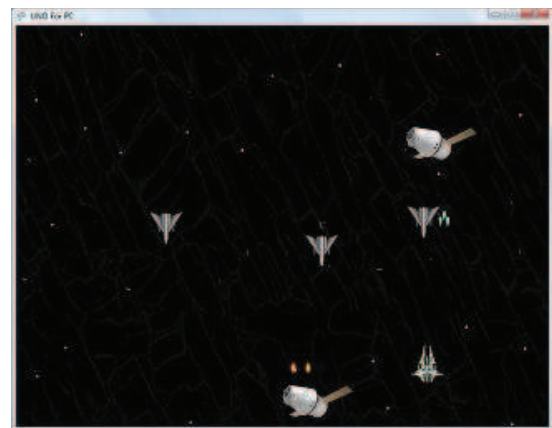


Figure 5: Student XNA game – Guerras Estelares

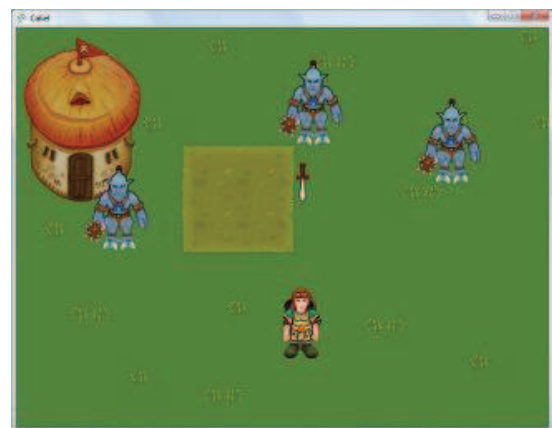


Figure 6: Student XNA game - Caliel

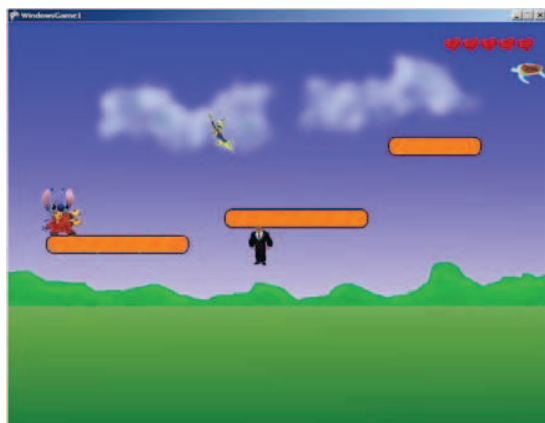


Figure 7: Student XNA game – Gorbs



Figure 8: Student XNA game – Pede pra sair, Osama!

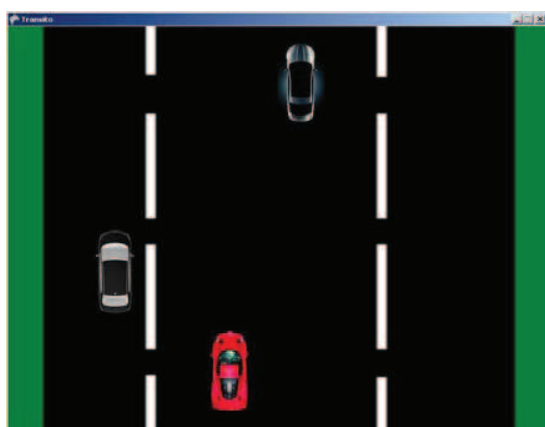


Figure 9: Student XNA game – Trânsito

4. Satisfaction Survey Results

A survey was submitted to 47 students who started the course. They concluded at least one of the proposed weekly activities. From those, there were 25 students that answered the survey questions. At the end of the course, 17 students finished their game projects and were approved.

The main purpose of this survey was identify the results of this teaching experience and detect the possible flaws to enhance the course methodology for the next classes.

4.1 Questions about student profile

These questions outline the student background and give support for the course evaluation questions.

4.1.1 Question 1: Your name (optional)

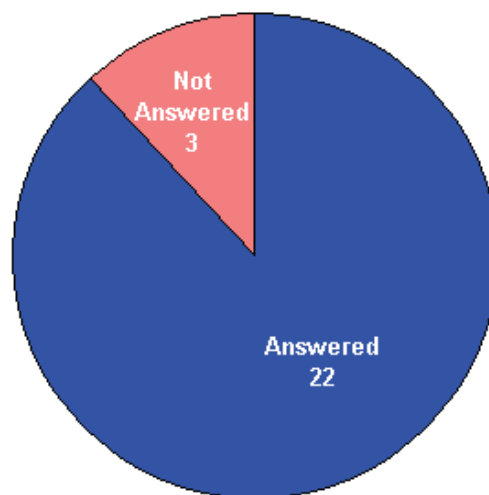


Figure 10: Question 1 results

4.1.2 Question 2: Your background is:

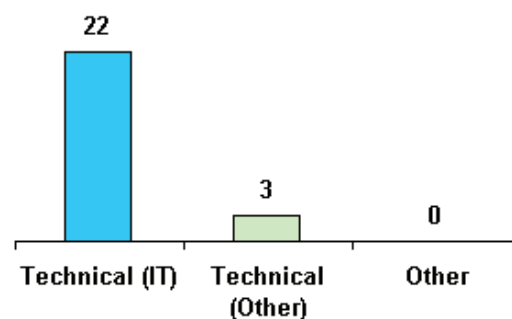


Figure 11: Question 2 results

4.1.3 Education level:

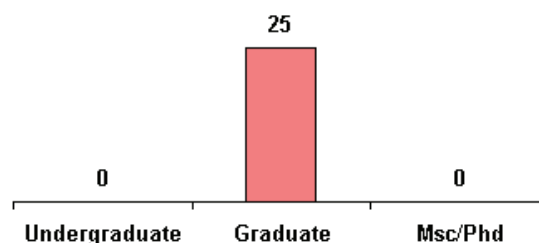


Figure 12: Question 3 results

4.1.4 Is this your first e-learning experience?

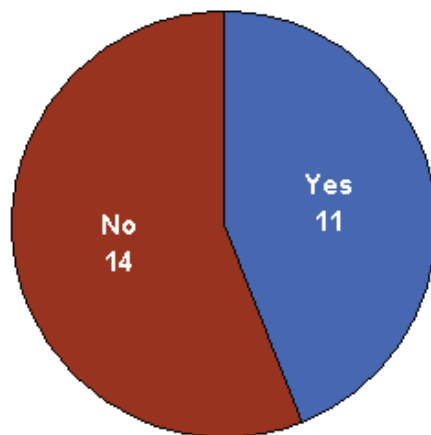


Figure 13: Question 4 results

4.2 Questions about course evaluation

These questions are substantial to identify both strong and weak points present in the course. They also intend to detect problems or difficulties concerning the resources available to the students.

4.2 Question 1: Rate your learning experience of game development at a distance

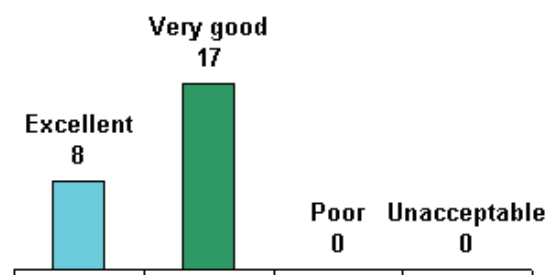


Figure 14: Question 1 results

4.2.2 Question 2: What reasons brought you to this course? (multiple answers allowed)

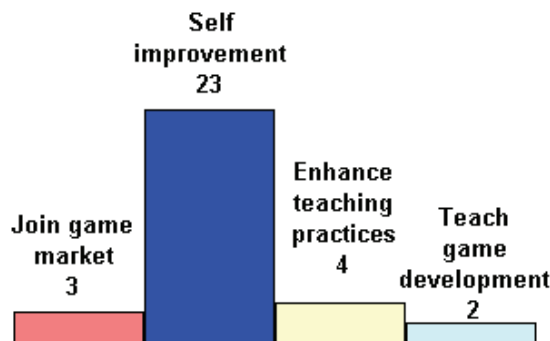


Figure 15: Question 2 results

4.2.3 Question 3: Tag the advantages of learning games at a distance (optional with multiple answers allowed)

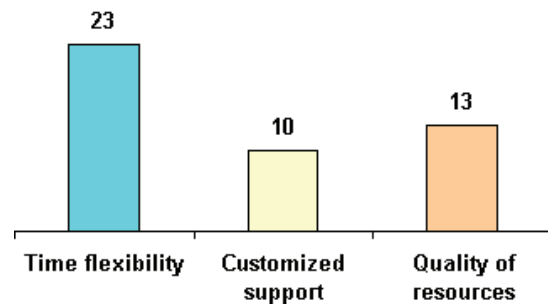


Figure 16: Question 3 results

4.2.4 Question 4: Rank the resources

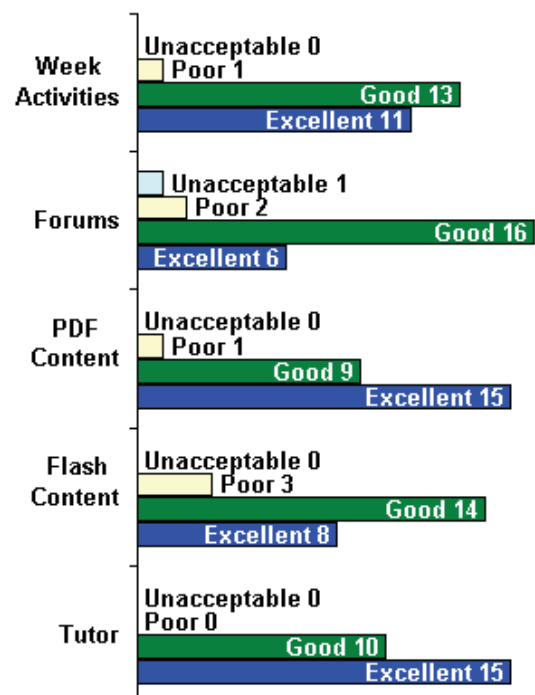
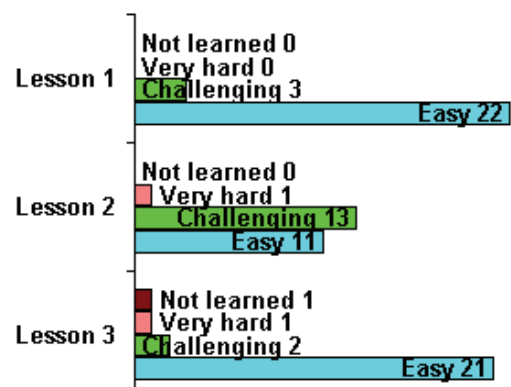


Figure 17: Question 4 results

4.2.5 Question 5: Indicate the difficulty learning degree in the lessons



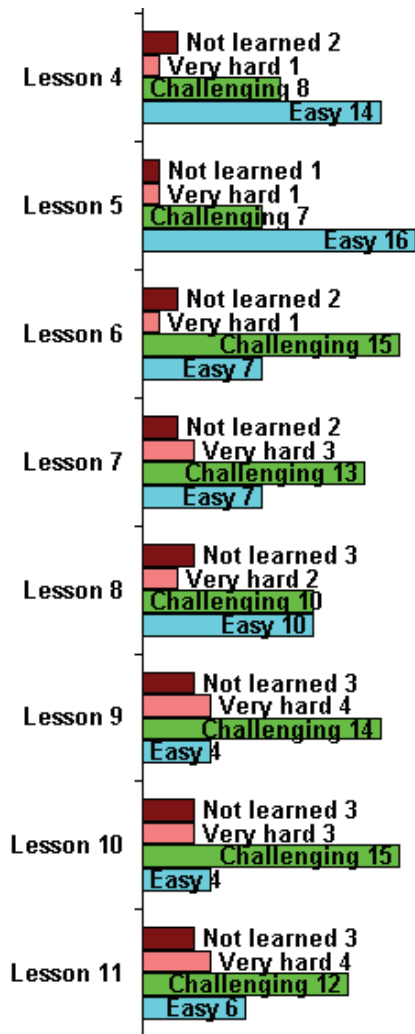


Figure 18: Question 5 results

4.2.6 Question 6: Rank the final quality of the game developed by you during this course

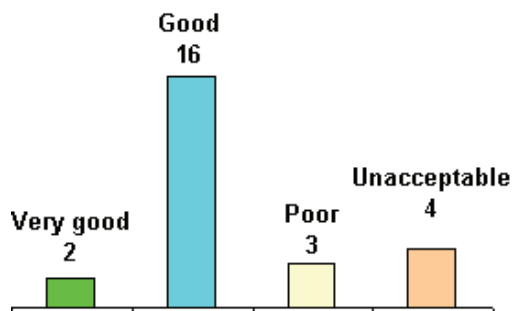


Figure 19: Question 6 results

4.2.7 Question 7: Will you use the acquired knowledge in your personal or professional life?

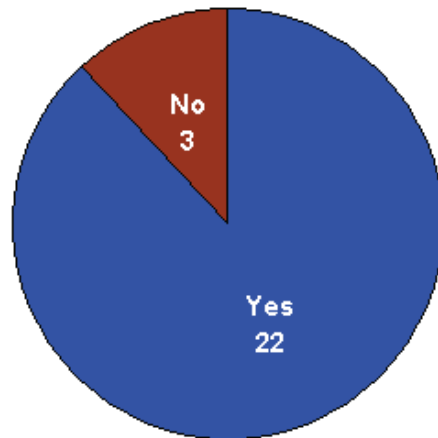


Figure 20: Question 7 results

4.2.8 Question 8: List the causes for you dropping the course (optional with multiple answers allowed)

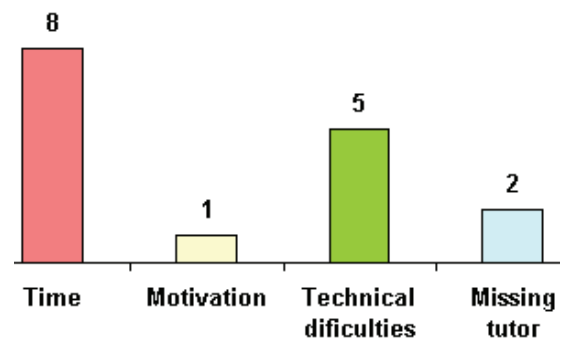


Figure 21: Question 8 results

4.2.9 Question 9: Would you enroll for a 3D game development course?



Figure 22: Question 9 results

4.2.10 Question 10: Observations and suggestions of the students for the course

1. I faced difficulties while accessing the site on the week activities delivery dates;
2. We could receive more support from the tutor, concerning the lessons. Anyway, this course is very good and I really liked it, despite not completing the course. Thanks for all;
3. A 3D game development course would be fine;
4. Some personal matters made me give it up. The course is excellent and I would like to enroll in it again, if possible... I work with IT and would like to conclude this course afterwards;
5. Would like to congratulate our tutor/teacher/content author for all effort and dedication during this course;
6. All PDF course content could be available at the beginning of this course, so the e-learning students can arrange their own study time. The slow content distribution rate meshed things a little;
7. Due to some tendinitis, I could not use the mouse. Some problems with Windows Vista and Visual Studio 2005 made me waste a lot of time, preventing my advance on lessons. There could be more content available for download after the first lesson;
8. The course is very good and easy to learn. The time flexibility is a strong point. Many people give up on learning due to a lack of time. I liked the course methodology and plan to attend other Governance modules;
9. I liked it a lot. May this course encourage the creation of similar quality courses, mainly complementary;
10. I liked this course a lot. You could improve the tutor feedback (sometimes it was given a little late) and create at least one regional students meeting, to stimulate the communication. Congratulations and good luck to all the team!
11. It would be more interesting if all the students were guided to build the same sample game presented on lessons and only afterwards create their own;
12. There should be an online support with a fixed schedule, to clear the student doubts. There could be a chat room. My learning difficulty came from a doubt answered only 15 days after my project was done. This confused and discouraged me. I still liked this course a lot and will attend it again;
13. If Would I enroll in a 3D game development course? FOR SURE!!! There could be 2D game samples available, so the students have access to

different implementation codes, with several methods and the use of input devices, like a joystick. Samples offer a quick way to learn by analyzing their codes;

14. In the first lessons, the idea of searching and classifying games according to their learning content was very good and relevant to the course. Each student idealizing and crafting his own game design document was also very important. However, given the diversity of students and the week activities complexity, all the students could develop the same game. That makes it easier for the teacher to guide the course and avoid some students abandoning their already initiated game projects, sticking to the lessons game sample, as I did;

15. Congratulations for the excellent course! A sequel to this course could address other 2D games related topics. A permanent forum for all students, ex-students and tutors could also be created.

16. I lingered to idealize the game, so the other week activities were impacted. I believe that a brief summary, highlighting the language possibilities for game development, and a 2D sample game demonstration could facilitate the start of week activities.

5. Conclusions

Distance teaching game development is a great challenge. The teacher must build the lessons using the most clear and comprehensive possible language. The use of discussion forums and chats are fundamental to motivate the students and reduce the doubts that naturally appear with the distance between the students and the teacher. Moreover, it is very important to stimulate and ensure the effective learning of the students, which can be done by proposing several activities through the course, both reflexive and practical.

The most similar work with the course presented here is the video tutorial [Waters 2008]. However, it does not allow teacher-student or student-student interactions.

Despite the diversity of the student's background, the survey results have shown a successful and profitable experience for them. The games developed during the first time this course was offered can be found in: <http://gameplayer.spacesocket.com/games.htm>.

Future works can focus at a better interaction with the students, the key factor of all courses, investing in chats and messenger-like tools to improve the final learning results. A game project evaluation criterion can be developed, considering both technical and design aspects. A methodology for analysis of survey results could also be created.

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