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Web 2.0 Tools in High School in Portugal: Creating Screencasts and Vodcasts for Learning*

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In this article, we present an experiment carried out in an 11th grade class in the curricular subject of DG (descriptive geometry). In a context where failure is more in the national exam, as well as in the discipline's attendance, the main objectives that motivated the implementation of this educational experience, were, on the one hand, to increase the interests and motivations of students for learning DG and, on the other hand, to prepare them for the final national exam. The project consisted of the development of multimedia applications based on the concept of podcast/vodcast/screencast—the geomcast. These applications were created by the teacher and students (in small groups), whose objective was to enable students to review the discipline's curriculum contents in any place or at any time, from the Internet, iPods or mobile phones, whenever the memory needs to be refreshed, since these multimedia applications were always available in the class blog.

Keywords: DG (descriptive geometry), Web 2.0, national exam, podcast, screencast, vodcast

Introduction

We cannot remain indifferent to the changes we have been watching in the educational scope, marked by the development of the new ICT (information and communication technologies). It is necessary to rethink the practices, methods and pedagogic strategies used by the teachers, in order to contribute to the innovation in the classroom.

The issue regarding the importance of the curricular integration of the ICT is a recurrent subject regarding the educational policies, at a national and international level. For this purpose, the ISTE (International Society for Technology in Education) published in June of 2008, a report which presents the new National Educational Technology Standards (Nets-T, 2008) destined to teachers. In the referred document, new recommendations were made, directed to teachers in a sense to render them responsibility for their role as creators of pedagogic experiences that involve the use of technologies for learning and teaching.

The Portuguese government has also been showing an increasing concern with the issue regarding the ICT's curricular integration in the teaching/learning process. In that sense, in September of 2007, the Technological Plan for Education (ME (Ministry of Education), 2007) was created, which stated that the path towards the knowledge society imposes a change in the traditional teaching and learning methods and an investment in adequate pedagogic tools, contents and materials. According to the referred document, the actions to be implemented are structured in accordance with the three main axis of action—technology, contents and training. The axis

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"contents" are particularly important in the context of the investigation we aim to carry out, since the applications which sustain them are essential for the change of the pedagogic practices, favoring the use of more interactive and constructivist teaching methods, contributing to creating a lifelong learning culture.

The DG (descriptive geometry) is responsible for the study of spatial forms, and it is also a work tool necessary and essential in several professions, such as the case of the architect, who uses DG when he/she needs to graphically solve a problem on objects in a given space. It is a discipline which develops the reasoning, the geometric rigor, and the spirit of initiative and organization.

Throughout the years, several experiments have been carried out with the purpose to solve the difficulties that the students reveal in understanding abstract elements, such as points that have no dimensions. One of the ways that has been experimented by most of the teachers, to help the relation between the geometrical objects and their representation, is model construction. These models can be as simple as an opened book, simulating the projection plans, and an eraser simulating a point or a pencil simulating a straight line. However, these models—3D applications and software which help to visualize the problem always present limitations, which begin in an insufficient simulation and, consequently, have appeared, in order to solve these difficulties. There are also several resources available in the Web but, as we could notice in our experiment with students, they revealed that they did not feel comfortable when using them, since many of these applications require previous knowledge of the curricular contents, not adapting to a teaching method that was supposed to be more personalized and adapted to the style and development of each student.

In the sense of introducing, in a creative and productive way, the highly popular Web 2.0 environments in the teaching/learning process of DG, we decided to implement a project in which the students developed multimedia applications, based on the podcast/screen cast concept—the GeomCast. It was carried out in a collaborative work logic, where the students got involved in a common task, on which the contribution of each person depends and is dependent of the contribution of the peers (Davis, 1993), and in a constructionism logic, since the students, with the help of the digital technologies, create artifacts and, by doing so, create their own knowledge: "Constructivism is the idea that knowledge is something you build in your head. Constructionism reminds us that the best way to do that is to build something tangible—outside of your head—that is personally meaningful" (Papert, 1990).

The creation of these multimedia applications will allow students to review the curricular contents in any given place or at any time, from the Internet, iPods or mobile phones and to prepare themselves, in this way, for the national exam of DG.

Meanwhile, from the moment these multimedia applications are made available in the class blog, to be used by themselves, their colleagues and also by all the cybernauts that may need to study the DG's contents provided in the podcast, we can consider that the work developed is in conformity with the principles of the communal constructivism proposed by Holmes, Tangney, Fitsgibbon, Savage, and Mehan (2001), since the apprentices build knowledge that can be reverted in benefit of the community. According to Ramos et al. (2003), the communal constructivism can be defined:

> As an approach in which the students not only learn through the construction processes of knowledge within its context and through the emergent social interactions in the learning context (social constructivism) but also in situations of active involvement in the processes of knowledge construction for the others. This is, to learn with others and learn for the others, breaking up with conventional boundaries of learning and curriculum. (n. p.)

In fact, by rendering the available contents in the Web, the students leave a record that can be useful for

others to learn with their experiences. By stimulating this kind of attitude, we contribute for the student to consider the school as a place where he actively participated, leaving his testimony, his trail, his brand and not as a mere place of passage (Holmes et al., 2001).

Web 2.0 and the Podcast

According to Coutinho (2007; 2008), we should regard the Web 2.0 as a synonym of a new look over the innovative potential of the Internet, which implies a more active participation of all the users, in the name of a plural intelligence, shared or collective, strengthening the concept of information transformation and of collaboration among the internauts, the sites and virtual services. We have changed from consumers to true producers, while users that contribute to the structuring and construction of the content.

Also known as social and collaborative Web, the Web 2.0 shows all of us teachers and educators a new path to follow, marked by the flexibility of the learning process, by the individual capacity to change and edit contents, by the possibility to establish more ambitious objectives, and by the definition of new personal strategies, interpersonal and collaborative for the construction of knowledge, through experiments carried out with tools from the new generation Internet, such as blogs, wikis, messengers and sites like MySpace, Pandora, Youtube, Flickr and Wikipedia (Hart, 2007).

The Web 2.0 opens to education a whole space of informality and playfulness which motivates children, youth and adults for the construction of enriched learning and for the development of competences essential to all of the informed citizens of the 21st century, such as being intervenient, producing contents, having critical ability, communicating in the Web, working in collaboration and participating in communities which are distant, but with common interests.

In a synthesis of the studies carried out over the Web 2.0 subject, Coutinho (2008) concluded that, in general terms, the Web 2.0 tools may constitute vehicles for the development of numberless learning facts and competences which, in formal contexts, would become many times boring and not motivating. However, the author verifies that the blogs are the tools mostly used in the Portuguese schools, requiring empirical investigation to evaluate the potential of other technologies, namely, the podcast, which constitutes the object of study of the present investigation.

The term “podcasting” was coined in early 2004 by Ben Hammersley (2004), an English journalist of *The Guardian*, to refer to the radio interviews that Christopher Lydon (Retrieved from http://blogs.law.harvard.edu/lydondev) made in the Internet, with the help of a MP3 recorder and a pair of headphones, which allowed proving the applicability of the weblogs to the radio.

According to several authors, the term “podcasting” is presently used to designate a form of publishing of digital media file collections (audio, video, images, text or any other type of file) which are distributed through the Internet. Meanwhile, several variations of the term can be noted, which tend to specify the media elements’ typology used in its production. Meng (2005) used the term “vodcasting” to specify contents composed by video, and not merely by audio, which were generally reproduced by personal computers or in the presently disseminated MP4. In this case, the prefix “vod” comes from the expression “video on demand” and implies the video capture through a video camera.

Regarding the screencast, it consisted on the screen capture through which the computer users’ actions were recorded (ELI, 2006), usually accompanied by audio (narration) and distributed through RSS (really simple syndication).

These applications can easily be stored in blogs and Web pages. The visualization of these applications,

which can incorporate demonstrations of basic concepts, solving of exercises (including examples of how to solve them, step-by-step) and software tutorials, can be repeated when necessary and the student can watch the way a certain application is handled, listening simultaneously to the teacher's explanations. Through this way, the student can review it when he/she deems necessary until he/she is able to understand the concepts that he found difficult, and whenever he/she needs to refresh his memory. These contents can be seen in mobile devices such as, iPods, mobile phones and MP4.

Regarding the studies carried out with the vodcast and screencast technologies, we could not find any reference to studies published in our country. In what concerns the studies carried out at the international level, we pointed out an investigation made in the Michigan University, on the use of screencasts containing explanatory mini-lectures on topics identified by the students as not very clear (Pinder-Grover, Millunchick, & Bierwert, 2008). According to the authors, the use of technology was considered to be very helpful for the students, as the impact on learning may be much greater if students and teachers learn to use this new resource. They notice that, in general, the students answered very well to the exam's questions, which were associated to the screencast, as one can read in the final synthesis of the study: "This study suggests educational promise in the use of screencasts to supplement lecture material in large courses" (p. F1A-14). Regarding the vodcast, we found a case study carried out in the Teesside University (Gkatzidou & Pearson, 2007), in which the technology was tested, and we quote, "In order to respond to the challenge of providing truly-learner-centred, accessible, personalized and flexible learning" (p. 331). The results indicate that many students used the vodcast to review the curricular contents, but also as a part of the weekly and independent leaning material. The investigators verified also that the use of the multimedia applications resulted in improvements in the students' approval rate in the final assessment tests.

The Study

The GeomCast project was being implemented in the current school year of 2008-2009, in an 11-student-class, as five are the male and six are female, from the 11th grade (terminal year for the discipline), in a secondary school of the Oporto district. The term "GeomCasting", created by us, is a variation of the podcast term—including the screencasts and vodcasts—in which the contexts integrate the curriculum of the DG a discipline.

The project consists the design and development of the students, working in group, as well as the teacher, of multimedia applications based on Web 2.0 tools—the GeomCasts—with the purpose of increasing the interest and the motivation of learning and, in this way, contribute to the students' success in the national exam of DG.

In a dedicated session, the teacher presented the class with the Web 2.0 concept as well as the Jing project and several screencasts prepared by herself, teaching students how to use these new tools. Several examples of podcasts with video and audio were watched.

In the same session, a class blog was created in Word press, whose chosen name b-geometria descritiva (retrieved from http://bgeometria.wordpress.com) came up after the explanation of the b-learning (blended learning) and m-learning (mobile learning) concepts.

In conceptual terms, we considered that the GeomCasts can give much contribution by allowing a more personalized learning, where the student took on an active role as a manager and builder of knowledge (Moran, 2000), since, supported by his peers, he prepared and created his own GeomCast episode which, after being evaluated by the teacher, would be published in the blog, for the class and for the whole world. Since the suggested activities for the creation of the GeomCasts are the solutions of problems to prepare for the national

exam of DG and, as the students develop them in group, in spaces outside the classroom, we can say that, in a certain way, the development of these multimedia applications constitutes an original and innovative strategy of achieving a 3 in 1 by allowing for: (1) the learning of DG to be learner-centred (centred in the student) and adapted to his own learning style and rhythm; (2) the students to get involved in an activity in which multimedia products are created, at the same time as they study for the discipline's national exam; and (3) an original b-learning format to be tested, in which the distance learning component is the students' responsibility, who actively contributes, producing contents that can be useful to the colleagues and, to many other cybernauts of the Web who share the same difficulties in learning DG.

In the sense of better implementing the empirical investigation (fieldwork), four questions were formulated to guide the investigation, which sought to be understood, the development/creation of GeomCasts by the students:

(1) Promotes significant learning of the DG discipline's contents;

(2) Increases the motivation and commitment of the students to learning;

(3) Promotes collaborative learning;

(4) What advantages or disadvantages this DG learning methodology presents.

For the purpose of assessment and monitoring of the activity, an initial questionnaire, a brainstorming session and an intermediate assessment were carried out during the experiment. When finished, a final opinion questionnaire will also be applied.

The initial questionnaire, whose design was based on an instrument developed by Costa (2008), was applied before the pedagogic activity was suggested to the students and its goals were to: (1) characterize the participants regarding variables such as, the school year, gender and age, assessment obtained in the discipline in the end of the previous school year; (2) identify the Internet access conditions; (3) evaluate the frequency and use they make of the computer; (4) catalogue resources used in the research activities for the discipline; (5) identify the difficulties felt in the research carried out in the Web for the discipline's school work; (6) gather information on aspects regarding the DG discipline and the ICT's (attitudes and perceptions in relation to DG); and (7) identify the preference for group work or individual work.

The intermediate evaluation was carried out in mid-February with the purpose of monitoring the work finished up to that time. For this purpose, three open questions were presented, to which the students answered in written form, using a paper sheet from their notebooks.

Development of the GeomCasts

Throughout the project, GeomCasts were developed in different programmatic contents which are object of assessment in the national exam, namely, the Parallelism, Perpendicularity, Metric Problems, Tangent Planes and Plane Sections.

The GeomCasts creation by the students was processed in the following manner: once the presentation of each of the programmatic topics referred to above was concluded, exercises from exams of previous years were distributed to the groups. The groups, which were carefully created by the teacher, considering the analysis of the initial questionnaire and the different levels of difficulty in order to balance in terms of knowledge (joining weaker students with good ones), would have to solve the exercises and create the applications outside the class since, due to the extension of the discipline's program, the GeomCasts could not be created during the time destined to the presentable classes. This requirement seemed pertinent to us since it concerned with teenage

students, with ages between 16 and 18, in which the majority (eight students) had access to the Internet at home and, in the school and had access to work spaces with computers connected to the Internet.

The created GeomCasts had to be delivered to the teacher one week prior to the assessment test so that the teacher could assess them and, later on, publish them in the class blog, allowing for the consultation by the colleagues who could then take advantage of one more study elements for the final assessment test.

Regarding the GeomCasts construction process, the groups could choose the video format—vodcast—or screen capture—screencast (see Figure 1).

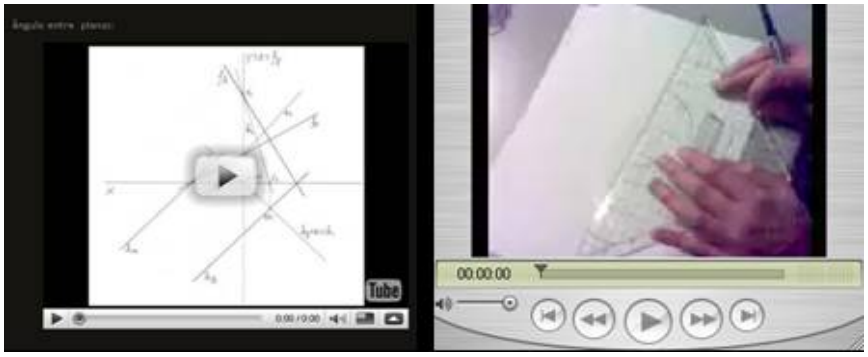

Figure 1. GeomCasts created by the students.

The students, who chose the video format, recorded the solving of the problem, orally justifying the steps and options made. Generally, the groups (of 3-4 elements) distributed the tasks among themselves. One student handled with the video camera; while another solved the exercise step-by-step and a third described it orally (the groups were responsible for the task distribution). The fact that each group wanted to present a good quality work (without mistakes), would lead them to carry out several attempts, until the GeomCast would fulfill their expectations. This process was very useful and effective, since the students gradually came to understand and assimilate the material without noticing that they were learning more.

In the case of the groups who chose the screencast format, the process consisted of drawing, in different supports, the several steps in the problem-solving process, which would then be scanned and inserted into a PowerPoint presentation. The final result consists in that recorded presentation, also accompanied by the oral justification of all the steps and options made by the students in the problem solving. Also in this process, several attempts were made, which contributed for the learning of the topics. Some students even commented that, if they would come to the need to solve identical exercises, they would not have difficulties.

The created GeomCasts were later on made available in the class blog and the teacher carried out its organization by programmatic contents, in a page corresponding to the 11th school year, entitled “11º ano”.

Results

Initial Questionnaire

Through the analysis of the results obtained in the initial questionnaire, we verified that nine students were 16 years old, one was 17 and another 18 years old; the grade average obtained in the discipline in the past year was 13 points. We could also verify that, in general terms, the students like the discipline (although the majority states that they only like some of the contents), and that they consider it useful for their daily life.

Regarding the group work, only one student prefers to work alone, since, from his perspective, in group work only some elements actually work. The remaining respondents prefer to work in group, justifying the

chosen option with the motives (in decreasing order of importance): (1) to make the learning process easier in an investigation or in the solving of tasks/problems; (2) to improve each one's sense of critical thinking; and (3) there is greater help among each other.

In what concerns the materials used in the research, the respondents use different types of supports, with particular emphasis on the research made on the Web and the digital support. The difficulty in finding information on subjects related to DG was the reason indicated most by the students when inquired for the difficulties found during research.

Regarding the use of the computer, most of the students already use it for several activities, namely, for chatting, for text processing as well as for downloading audio and video files.

In general terms, we consider it a class with reasonable knowledge in informatics and with interest in technologies, a necessary condition for the fulfilment of the study we aimed to carry out.

Brainstorming

The brainstorming was carried out during the presentation of the activity to the students, with the purpose of gathering additional information regarding the perceptions and expectations they had, as well as the students' previous knowledge on the concepts of podcasts/screencasts as educational resources. As a conclusion of the brainstorming, we could notice that: (1) There was some dissatisfaction from the students regarding the concept of Web 2.0 and its philosophy; (2) The podcast concept was familiar to only three students and that only one had used a podcast in his iPod; and (3) The students enjoyed the idea of using Web 2.0 technologies to support problem solving in DG. It was then decided to create a blog, which would function as a repository of the GeomCasts created by the students and the teacher and which would also include "safe" links to guide the students in the study.

Intermediate Assessment

As referred previously, with the purpose of monitoring the activity development of the GeomCasting, an intermediate assessment was made in the end of February 2009. It regarded the presentation to the class of a set of four opened questions, to which the students gave an individual written answer, in the end of one of the discipline's presentable class.

Regarding the first question made: Did you like to create the GeomCasts? Why?, all the students stated that they enjoyed creating the multimedia applications. As an example, we quote the answers given by two of the participants:

> I enjoyed very much to make this sort of work, it's a way of learning how to do the exercises, step-by-step. I came to better understand the information, with this type of work (perpendicularity between lines); (A2)
>
> I enjoyed doing, it's a different way to learn and it's also more attractive than using only the books, we can solve the exercises step-by-step, making our life easier by understanding the exercise. (A7)

In what concerns the second question made: Did you like to watch the GeomCasts? Why?, six students said yes and only one student did not answer. Once more, and as an example, we quote some of the given justifications:

> Yes, because we learned how to solve the exercises and got our doubts answered with the explanation given in the solving of the exercise, besides being a technological format, which arises more interest; (A3)
>
> Yes, they are useful to get our doubts on the exercises answered, and helps those who solve the exercise to better understand it. (A5)

Regarding the third question placed to the students: Did you find this methodology useful for your learning? Why?, all the students agreed by answering positively. We quote some of the given answers:

> Yes, it helps us to study and it's a way for us to get prepared for the upcoming exam; (A3)
>
> Yes, since it can help in the study, when we encounter difficulties. The fulfillment of more exercises may help those who solve them and the remaining colleagues. (A9)

Regarding the fourth and final question placed to the students: Which relative advantages do you find in the GeomCasts as for the two of the used capture forms—vodcast and screencast?, the opinions differ, with students placing themselves in favor of one and/or the other of the GeomCast modalities. Once more, and as an example, we quote some of the given answers:

> I prefer the screencast, since its readability is much better than in the vodcast; (A7)
>
> On one side I prefer the screencast and on the other I prefer the vodcast. In the screencast the exercise is much more readable; in the vodcast the exercise is made step-by-step but it's not as readable. (A2)

Conclusions

Although this study is not yet concluded and, in that sense, the presented results are still preliminary, in reality, as teachers, we feel that the project already begins to give its fruits. In fact, we verified that the students showed great interest, either in the concepts explanations provided by the teacher, or the exercises made by the group, having most of the students stated that they were of great utility in the support of the study and the preparation for the final exam. On the other side, such as referred by the students in the intermediate assessment, the fact that they had to repeat the solving of the problem several times in order to obtain a GeomCast with quality meant, for the "author group", to study with greater depth and detail the presented topic, so that their colleagues could access a clear and rigorous document, capable of helping the study and the preparation for the discipline's assessment tests. Just as Ramos et al. (2003) pointed out, the technology enabled the creation of contents by students, accessible to anyone who owned a system connected to the Internet, in a logic of collaborative work and of knowledge sharing in which the ICT's contributed "to the progressive enrichment of the learning environments and contexts allowing, not only the school to be the space for individual and social construction, but also each one to learn for himself and for others" (Ramos et al., 2003).

Meanwhile, with these new tools, the students cease to depend only from the manuals, written texts and/or notes made during the presentable classes. The GeomCasts allow students to learn in a more self-guided and personalized manner, satisfying the learning style and speed of each one. On the other hand, the fact that the students themselves create the GeomCasts, significantly helps in the curricular content comprehension and an approach to a constructionist type of knowledge that Papert (1980) and his colleagues defended so well. For the construtionism, human beings learn better when they are involved in the planning and construction of objects or artefacts they consider meaningful, sharing them with the surrounding community. The process of the object's external construction is, in parallel, accompanied by the inner construction of knowledge on itself, improving therefore the cognitive capacities of the individuals. Resnick (2008), disciple of Seymour Papert, spoke of a "creative thinking spiral" where, in the interactions generated in the manipulation/creation of artifacts, "children imagine what they want to do, create a project based on their ideas, play with their creations, share their ideas and creations with others, and reflect on their experiences" (Resnick, 2008, p. 20).

These tenets motivate the development of the study we come here to present. However, it needs to be verified how the students will behave in the decisive test and the final exam of DG. Meanwhile, even if the

results of the final exam do not reveal themselves as surprising, we believe that other competences were developed—autonomy, learning to work in collaborative form and learning how to learn—and that the global balance of the GeomCast is, for that matter, highly positive.

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