I´m a Creative not a Programmer!
Computer Programming for Artists Supported by TabletPCs

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Abstract: Teaching computer programming to artists and designers with no prior programming experience is a challenging task. Programming relies on the ability to observe, analyse, classify and organize thinking, analytically structuring the reasoning, processes with which artists and designers typically are not familiar with or at least do not formalize them in the same way programmers do.

The aim of this paper is to share an experience on the teaching/learning of computer programming by artists and designers. This work was developed during the school year of 2007-2008, in the context of the course of Fundamentals of Web Programming part of the Masters Program in Technology and Digital Arts of the School of Engineering, University of Minho. In this experience, the fundamentals of Competence-based Pedagogy, using constructivist and cooperative methodologies we applied. We strive towards the integration and exchange of knowledge among students, and thus develop the desired competences in the students. To accomplish this goal, we integrate some of the functionalities provided by tabletPCs in our pedagogic strategy, aiming at fostering active participation of the students, increasing their motivation and developing programming competences. This work also presents a scenario for employing technology to support active learning.

We have collected data which will help us to understand the extent to which our objectives have been reached, in what our pedagogic strategy is concerned, but also in what the use of this technology is concerned.

Keywords: active learning, e-learning, tabletPC, programming, competence-based pedagogy

1 Introduction

For an artist or a designer, what is the meaning of the material one is learning? What is the relevance of the subject? Computer programming…what for? Learning needs a relation with the reality, so it can survive in the mind of the student [Es00, cited by So04].

Several languages[1] were specifically created to teach fundamentals of computer programming within a visual context to artists and designers. Processing language [Pr07] is an example of that. Programming requires its own terminology and it is necessary to learn the syntax and concepts of the language, such as variables, functions and objects. Using the Processing programming environment, students are able to start programming after only a few minutes of instruction [RF07].

However, we want our students to be able to interpret and use knowledge in situations not identical to those in which they initially acquire them [So04]; this means that we want our students to be competent in computer programming.

Through this experience we tried to promote collective participation and learn by doing, which are some of the best strategies for effective learning [FB03].

Tablet PCs are appealing devices to support activities based on free sketching. For artists, sketching is necessary for the development of ideas. Thus artists working in software need environments for working through their ideas before writing a final code [RF07]. So, we try to implement this process in our experience.

In the following section we will describe a classroom activity designed to develop a concept and translate it into a program. We employed several wireless HP Tablet PCs, which allowed students to augment, annotate and/or sketch the material presented directly onto digital files, while communicating and sharing their work, information among each other. We will then discuss some of your findings.

2 Experiment

Technologic support:

We use 9 HP TabletPCs with wireless capability. A separate wireless subnet was installed in the classroom. We also have a Wi-Fi shared video projector. In terms of software, we use the Windows Journal for writing/sketching and the Processing Development Environment for programming.
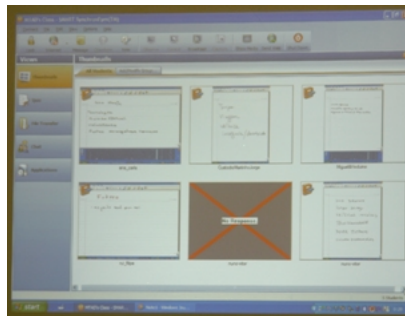

Fig. 1 - Classroom display

[1] http://www.processing.org/reference/compare/index.html

Fig. 2 – Students working

Fig. 3 - Students working

We use Synchroneyes SW teacher edition v7.0 [Sy07] installed in the professor's computer, and the student's version installed in all 8 student's computers. This software makes it possible for the teacher to observe what the students are doing in each computer (see Fig. 1). We group the students in pairs (see Fig. 2, Fig. 3), each student with its own pen.

Activity:

At this point of the semester the students had already been exposed to the basic concepts and structures of programming, and had worked on small programming exercises. The activity we worked on was the notion of a creative concept and the usefulness of the programming to accomplish that concept.

1. We give a theme to the students (in the week before the experience). In the case presented, the theme is "Future".

2. At the beginning of the class we invite the students to use the tabletsPCs and not their own laptop, explaining what we are trying to reach.

3. We always tell them to work in pairs.

4. We tell them to sketch words related to the theme (using windows journal). We tell them they have 1 or 2 minutes.

5. We stop them after the allotted time and called on each pair for responses. By using the video projector and the synchroneyes software, we can follow each students screen. We don't ask for detailed explanations, for it is not our intention.

6. The next task set is to choose 1 or 2 words from the list. We give 30 seconds.

7. When the time is over students present their choices.

8. Next task is to think on the words they had selected and in what way they can transmit the main idea. We give about 10 minutes.

9. Once again, when the time is finished, each pair of students connects to the projection system and presents their version. In Fig. 4 and Fig. 5 we can see two examples. We tell them we are not interest in evaluating concepts, but that our intention is to train the process of transforming concepts/ideas into instructions of a program.
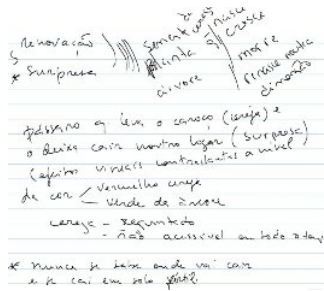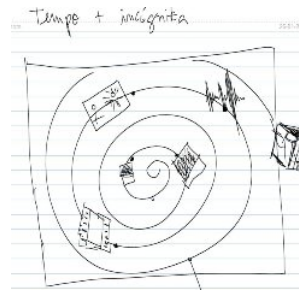

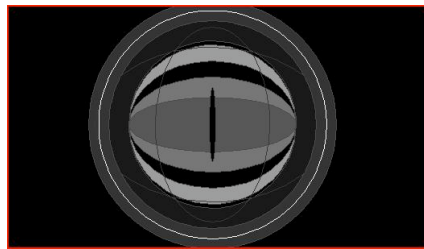Fig. 4 – Student's sketch

Fig. 5 – Student's sketch

Fig. 6 – Student's final work

10. Finally, the last task is to implement the idea with the processing environment. That task takes the remaining time of the session, about 1h 30m.

11. Nearly at the end of the session, we ask each pair to present to the others what they were able to accomplish.

12. We continue this work on the next session. During the session students regularly exhibit their work using the video projector and the synchroneyes software for communicating and sharing work. In Fig. 6 we can see an example of a student's final work.

3 Evaluation

After this activity we wished to understand the extent to which our objectives have been reached concerning our pedagogic strategy, but also the use of the technology in this particular setup.

An online questionnaire was made available in moodle platform [Mo08] to the fifteen students of the course; we received ten responses from the group.

In the following figures (Fig. 7 to Fig. 14) we illustrate the data we have collected. We show the results in absolute values because our sample is relatively small. In the next section we discuss the results.
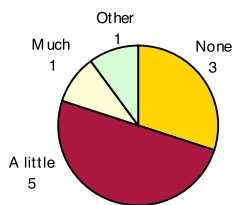

Fig. 7 - Question "In the beginning of the course, what was your level of knowledge of computer programming?"
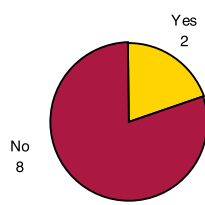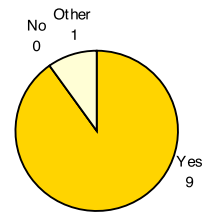
Fig. 8 - Question "Have you ever used a tabletPC?"

Fig. 9 - Question "Was making the sketch usefull for you?"

As we expected, the vast majority of our students reported no prior or little programming experience (see Fig. 7). Five of them choose "a little", but in fact they had some experience with html or flash, not really with programming languages. Only two of our respondents had used a tabletPC before (see Fig. 8).

Nine of the ten respondents find useful to make the sketch (see Fig. 9) and eight of the respondents find advantageous to see the colleagues' sketches (see Fig. 10). Eight of the respondents prefer paper and pencil to make sketches (see Fig. 11).
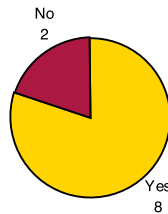

Fig. 10 - Question "Was there any advantage in seeing the sketches made by others?"
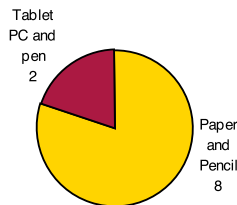
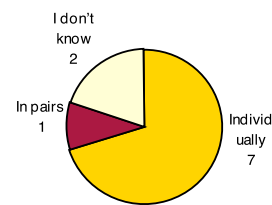Fig. 11 - Question "If you could choose, you would have made the sketch with…"

Fig. 12 - Question "If you could choose, would you have used the tabletPC…"

Seven out of ten prefer to work individually (see Fig. 12) though most of them seem to have worked in group since both interacted with the pen (see Fig. 13). For the given activity, five prefer the tabletPC against the personal computer and two are not sure (see Fig. 14).
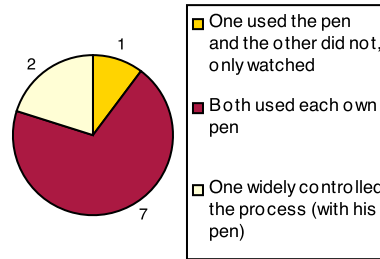
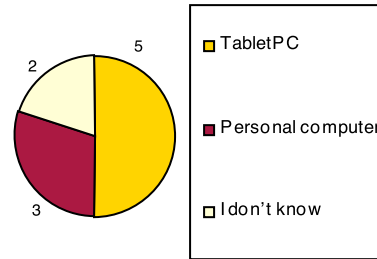| Fig. 13 - Question "Regarding the use of the pen, in my pair…" | Fig. 14 - Question "If you could choose, would you have used the… |

Respondents were asked to rate the importance of four items related to the effectiveness of this activity, where 4 indicates the most agreement with the statement, and 1 indicates no agreement. Table 1 shows the average results of these ratings.

Item	Result
A – it contributed to understand how we can translate an idea into a program	3.2
B – it made me learn more, through the interaction with my colleague	2.4
C – it raised my awareness to the relevance of programming	2
D – it did not contribute to the develop any aspect of programming	1.8

Table 1 - Items used to evaluate teaching activity's effectiveness

4 Results

Our assumption was that students would find this activity a valuable experience to learn to convert a creative concept into a program. Reflecting on the data collected with this questionnaire and presented in the previous section we discuss next our observations.

The students identify usefulness in sketching an idea, they recognize value on observing other sketches, but nevertheless indicate preference for traditional paper and pencil to make the sketch. This result surprised us since we expected them to appreciate the advantages of the digital sketch because it enabled the possibility of sharing it with the classroom through syncroneyes. For our students, in this case, digital sketches are no better than paper sketches which questions in this context tablets' usability and relevance in making a sketch.

The students reported they prefer to work alone despite the fact they learn with their colleagues and are aware of that (reported in Table 1). As teachers, we observe students interact and learn more when they are with others, so we are not in favour of individual work. Nevertheless working group is also propitious to distractions, and to prevent that we suggest to use active learning techniques, which make the students to be focus on successive tasks with each other within a limited period of time, in opposition to chatting, browsing the web, emailing, etc…

The students both used each pen, showing that they were actives participants in the activity; in part this was possible because of tabletPC pen-based interaction; normally we can use one mouse with one computer, and in this case we could use two pens with one computer.

The students seem to have liked to use the tabletPCs, but since most of them had no previous experience with tabletPC, there might be a novelty factor effect in that answer.

5 Conclusions

With this paper we share a scenario to increase the students' participation, to transform the students' learning experiences from being a passive receiver at the end of the transmission process initiated by the teacher, to being an active participant, involved in increasing mental activity and peer interaction, with the aim of strengthening thinking skills and reinforcing learning. We employ wireless Tablet PCs as enablers of these activities, in the context of a Masters Programs in Technology and Digital Arts.

Reflecting on our pedagogical strategy, our approach to develop programming competences in this group of students revealed to be adequate to us. We defined a goal, we made use of active learning techniques, we joined students and we gave each other a way to interact. As a result, the main objective was understood by the students (Table 1) so we evaluated the strategy in a positive manner.

Future work on similar activities could emphasise the relevance of programming in the context of a digital artist work as they reported that they did not find it answered by this activity (Table 1).

Considering the way we employed the technology, it seems to have had a relative value, meaning that, if it is not there, we will note its' absence, but if it is there, we will not note its' presence. We used tabletPCs, pens, wireless, projector, windows journal, synchroneyes, all for support the learning process, but the benefits of their use don't seem to be valued by the student. Reflecting on what we can do on future work, we should consider additional strategies to use the software to further promote the sharing of knowledge among students.

In conclusion, we can say that the use of tabletPCs, aligned with a pedagogical focus on the learner, fits well with our teaching style, with the students' needs and expectations for the course, as well as with the aims of the course itself.

Acknowledgements

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