Column: Student Forum

Challenges of Teaching to the New Generation of IT Students

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Today, due to the tremendous growth of the software industry, there are a wide variety of job opportunities for IT students; in many countries, this motivates undergraduate students to begin working as developers before they have finished their computing education. Sometimes, this situation causes students to take longer to finish their careers. In addition, this situation impacts the profile of students who participate in university courses since they might have real experience on the topics of the university curricula. Thus, teaching the new generation of IT students has become challenging, not only to be motivational for them, but also to provide them with relevant knowledge beyond the intended syllabus.

HOW THE GROWTH OF MOBILE APPLICATIONS IMPACT IN IT STUDENTS?

The growth of mobile applications impacts the skills that are required for IT people (particularly students) who are working in this area. Generally, students might think that it is enough to know some specific programming languages or operating systems, but there is more besides that; for example, they need to learn how to create mobile applications that are really useful for final users. This is one issue in which adaptations of the university curricula could help students to embrace new skills in order to cover that need.

The varied range of sensors available in smartphones allow creating mobile context-aware applications[1]; sometimes these applications are developed only to solve some specific problem using existing sensors' APIs. According to that, IT students are focused on learning, for example, how to use existing sensor's APIs, and they lose sight of what is really useful to offer with the collected information. In this context, it is important that IT students learn how to create usable context-aware applications[2] which are focused on people's real needs. To do that, IT students need to add skills about human-centered design in order to create user-friendly mobile applications.

When IT students learn about human-centered design, they can use it in their daily work. Thus, this not only improves their current practices, but it is also a new skill for their

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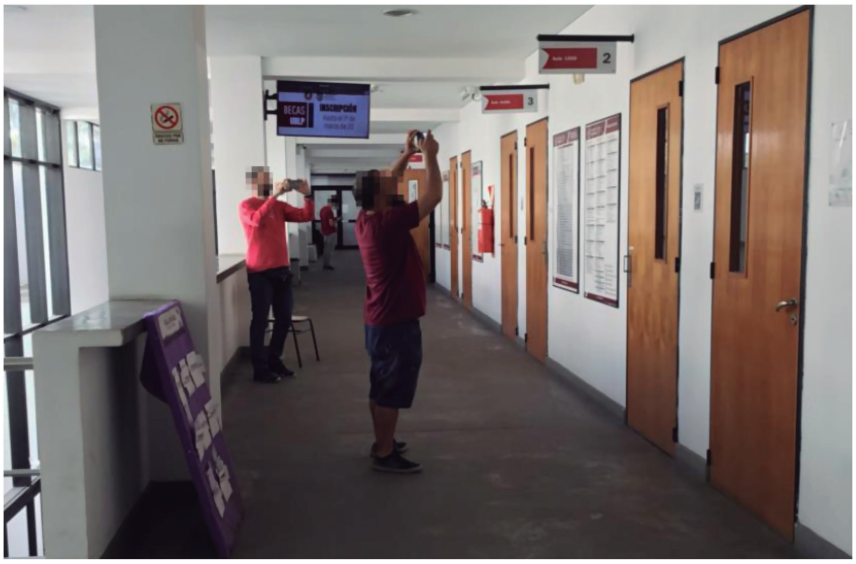

Figure 1. Students defined *in situ* a relevant location using our tool (December 2018).

careers. This is my observation with the students of mobile computing classes in the last 10 years.

HOW *IN SITU* DESIGN ALLOWS TO EXPAND THE VISION OF IT STUDENTS?

Context-aware applications, in particular location-based application, can be designed using maps or *in situ*[3]. Designing with a map allows marking relevant positions in which, for example, the user will receive some information or services. Meanwhile, *in situ* design implies visiting the physical place to mark and, in that place, the relevant positions. Co-designing, *in s*itu, these kinds of applications is enriching[4] because it allows inclusion of different visions of each participant in this process. However, the process is complex to put in practice because it requires an agreement between all participants.

Co-design is one of the characteristics of Design Thinking, which is "a discipline that uses the designer's sensibility and methods to match people's needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity."[5] Nowadays, Design Thinking is used for innovation in the industry. Taking this into account, it is interesting to involve students in co-design experiences as part of their courses.

In situ co-design is not a usual activity in industry, but it is a good experience for IT students; it not only allows presentation of the vision of a different kind of mobile application's design, but also makes them part of a novel dynamic design experience. Perhaps, this could be the initial step to transfer this kind of classroom experience as a settled practice in industry.

IN SITU DESIGN EXPERIENCE WITH IT STUDENTS

In 2018, as part of "Introduction to Mobile Computing" classes of the College of Informatics at Universidad Nacional de La Plata (an optional course for students in their sixth to eighth semesters), I have put into practice an *in situ* co-design experimental project. During this experience, we have been using an authoring tool (developed as part of a student's undergraduate thesis)[6], which allows defining location-aware applications based on different templates. In particular, for this experience, we used the "relevant locations" template. The tool provides a template to specify a name and a description related to each location and take a picture to identify what part of this location is relevant, and it can associate a sensing mechanism to the location.

The aim of this experience has been to explore the first part of *in situ* co-design approach within the College; the students had to define relevant locations thinking of a hypothetical IT Conference that would take place in the College. They had 20 min to use the tool to define potential

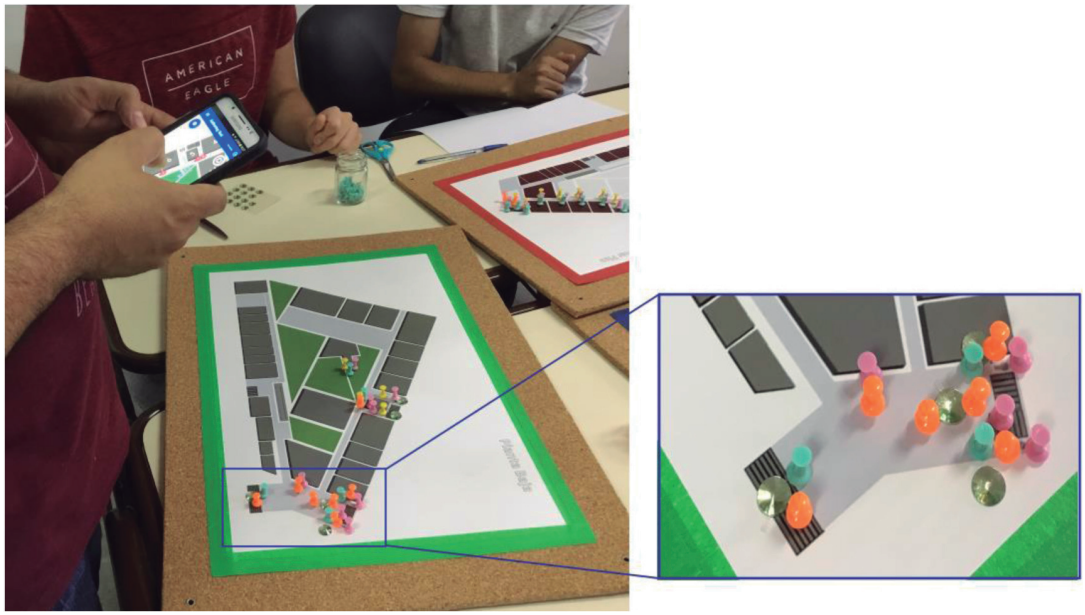

Figure 2. Using physical mock-ups to the consensus activity (December 2018).

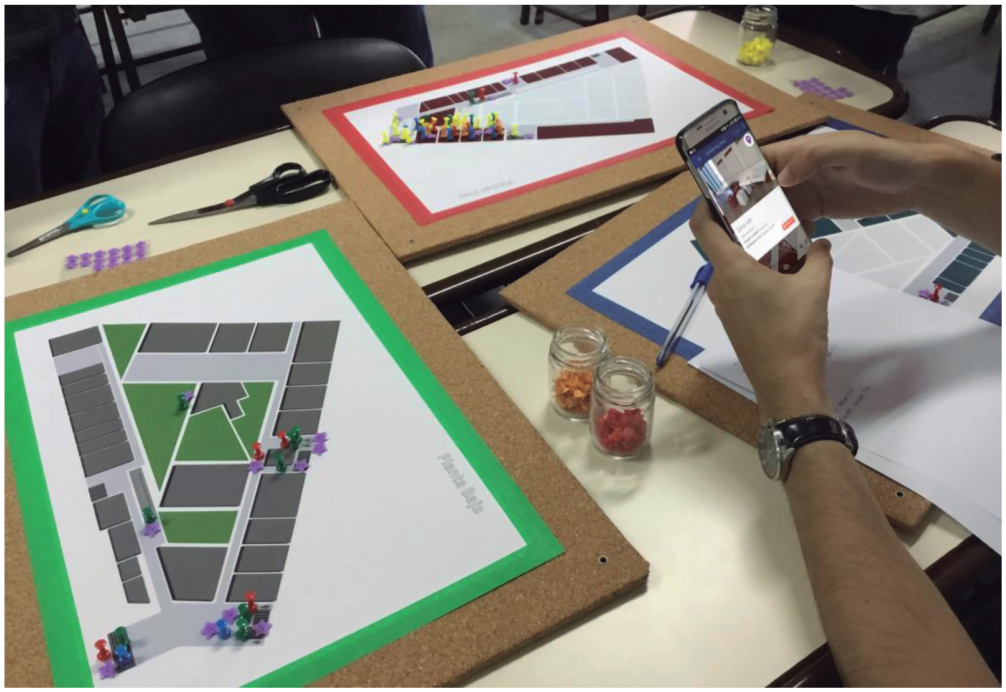

Figure 3. Student sees the picture that has been taken in one specific location (December 2018).

relevant locations for the Conference. This is an activity of "divergence" because it opens different possibilities of relevant locations to be considered in the final applications. During the 20 min, two persons observed the students behavior; all the students were concentrated in the task and visited the different floors of the building to do their work. We have observed how they took each picture related to each location, as shown in Figure 1. In addition, in this figure, the template of the tool to collect information about each relevant location is shown.

After the 20 min, all students returned to the classroom. Each group marked the relevant locations collected in physical mock-ups. This

activity allows observing, in a quick view, the coincidences or not in the election of relevant locations, as shown in Figure 2. Then, each group discusses and analyzes which of all relevant locations could be considered in the final application; each location agreed to has been marked with another label, as shown in Figure 2. The consensus is a "convergence" activity because it reduces options.

It is important to mention that in the consensus activity, it might happen that two or more participants have marked the same location; they should analyze the picture that each of them has taken related to it using the tool. This activity allows us to appreciate a different perspective of the same location; this was very constructive to the students to understand how each person could see the same location with different perspectives. In Figure 3, one can see how a student sees the picture that has been taken in one specific location.

This experience has allowed students to explore not only an *in situ* co-design approach for a context-aware application, but also, they learned to be aware of others' perspective of the same design issues.

As a further lesson learned, we found that it is important to use diverge and converge activities in almost any course of the university curricula. To do that, some Design Thinking's techniques can be applied. We are exploring brainwriting[7] during the diverge activity and the attractive-effort matrix (Gartner Cost Value Matrix: https://www.gartner.com/en/documents/2801719 (last access: 06-2019)) during the converge activity. This combination could be applied to any course activity that requires generating ideas and then select some of them.

Another important lesson learned is the time devoted to each activity; it should not take long to facilitate a quicker process. This generates motivation in the students to bring their best and then share what they have generated. The debrief process is another important aspect that should be included as part of any activity of the university curricula that allows students to add new knowledge or skills.

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