software was used to perform the Student's t-test in order to compare the answers by gender (boys and girls), and by year level (first, second, and third year of secondary education).

3. Results and discussion

The PCA with varimax rotation was used to verify the questionnaire structure containing six factors; each factor had five questions for a total of 30 questions. The six factors were retained in the PCA, and accounted for 66.813% of the total variance (Table 1). The questions' factor loadings were at least 0.400 for their own factor, and less than 0.400 for the other factors, with the exception of questions 1, 29, and 30 from the Relevance factor, and question 20 from the Complexity factor. Therefore, the PCA confirmed the initial structure of the questionnaire.

Table 1 - Rotated factor loadings and Cronbach's alpha values for the factors of the questionnaire.

Item	Factor 1 Negotiation	Factor 2 Inquiry Learning	Factor 3 Reflective Thinking	Factor 4 Relevance	Factor 5 Complexity	Factor 6 Challenge
Factor 1: α = 0.857						
1	0.540			0.404		
2	0.630					
3	0.736					
4	0.825					
5	0.749					
Factor 2: α = 0.832						
6		0.414				
7		0.749				
8		0.684				
9		0.679				
10		0.424				
Factor 3: α = 0.917						
11			0.764			
12			0.846			
13			0.791			
14			0.788			
15			0.819			
Factor 4: α = 0.834						
16				0.611		
17				0.660		
18				0.564		
19				0.598		
20				0.591	0.515	
Factor 5: α = 0.816						
21					0.657	
22					0.819	
23					0.723	
24					0.835	
25					0.422	
Factor 6: α = 0.794						
26						0.606
27						0.681
28						0.640
29				0.450		0.617
30				0.433		0.590
Total α = 0.938						
Total variance explained = 66.813%						

*Loadings less than 0.400 were omitted. Source: Elaborated by the authors.

The Cronbach's coefficient values ranged between 0.794 and 0.917 (Table 1). Such results indicated that the factors have internal consistency and are reliable in measuring the students' perceptions about the Tecnoteca. According to Spector (1992), the Cronbach's coefficient must be at least 0.700 to demonstrate the internal consistency of a scale.

Figure 2 shows the average values of students' perceptions of the six factors included in the questionnaire. As can be seen, the values ranged from 3.518 for the Negotiation factor to 4.538 for the Complexity factor. The highest ones were 4.538 for Complexity, 4.330 for Relevance, and 3.952 for Challenge. Such values indicated that most of the students concurred with the statements of the questionnaire. Chuang and Tsai (2005) found very similar values when analyzing internet-based learning environments, which ranged from 3.96 for Student Negotiation to 4.21 for Relevance. Their highest values were 4.21 for Relevance, 4.19 for Ease of use or Complexity, and 4.13 for Reflective Thinking.

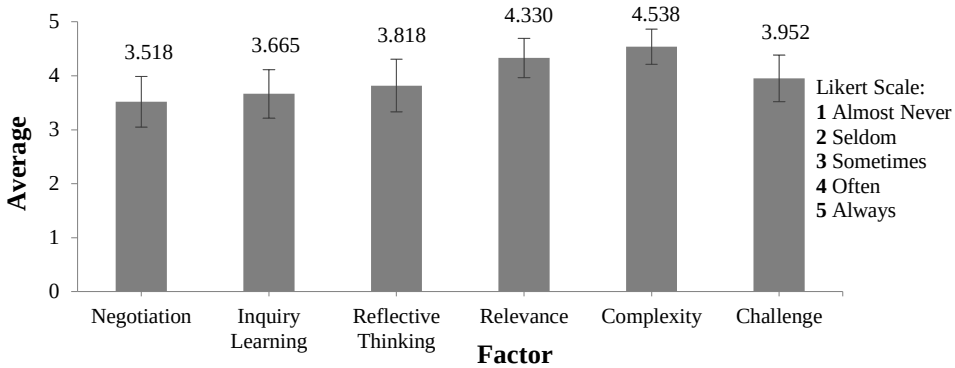

Figure 2 - Average values of students' answers for the factors of the questionnaire. Source: Elaborated by the authors.

In Table 2, we present the results of the Student's t-test comparing the averages of the answers from boys and girls. The test was significant only for the Relevance factor, in which the average from girls was statistically higher than that from boys, indicating that girls were more concerned with authentic learning environments representing real-life situations.

Table 2 - Gender comparisons on the factors of the questionnaire.

Factor	Gender	Average	Standard Deviation	*t* value
Negotiation	**Male**	3.470	1.009	0.616 (n.s.)
	Female	3.547	0.898	
Inquiry Learning	**Male**	3.697	0.954	0.733 (n.s.)
	Female	3.646	0.863	
Reflective Thinking	**Male**	3.680	1.001	0.169 (n.s.)
	Female	3.901	0.963	
Relevance	**Male**	4.170	0.815	0.031
	Female	4.426	0.654	
Complexity	**Male**	4.403	0.813	0.067 (n.s.)
	Female	4.620	0.516	
Challenge	**Male**	3.833	0.891	0.179 (n.s.)
	Female	4.024	0.849	

*n.s.: not significant. Source: Elaborated by the authors.

Many researchers, such as Chuang and Tsai (2005), Goldstein and Puntambekar (2004), González-Gómez et al. (2012), and Ong and Lai (2006), have been evaluating

the gender differences in the learning process mediated by technology. Some of them concluded that boys have more computer skills and are more willing to use and learn about these devices. Others indicated that boys present more positive attitudes and are more easily adaptable to computer-related learning environments compared with girls. Other ones pointed out that girls are more concerned with many aspects of e-learning than male students. They also indicated that girls usually face the technology for its social role, whereas boys are more interested in the machinery itself. Meanwhile, other authors demonstrated that students from both genders have similar preferences for internet-based learning environments. Our research showed that boys and girls have similar perceptions about most of the factors evaluating the multimedia learning environment, with the exception of the Relevance factor.

The data described in Table 3 show that students from different years of secondary education did not follow a pattern in their opinions. Only for the Challenge factor, no significant differences were found between the students' answers. For the other factors, at least one test was significant. One important result was that a statistical difference can be found between the responses in the Reflective Thinking and Relevance factors of students in the first and last year of secondary education. This finding can be attributed to the differences in age and maturity between the two groups of students.

Table 3 - School year comparisons on the factors of the questionnaire.

Factor	School year	Average	Standard Deviation	*t* value
Negotiation	**1st**	3.527	0.721	**1st - 2nd** = 0.018
	2nd	3.928	0.897	**1st - 3rd** = 0.129 (n.s.)
	3rd	3.276	1.068	**2nd - 3rd** = 0.003
Inquiry Learning	**1st**	3.573	0.771	**1st - 2nd** = 0.001
	2nd	4.072	0.618	**1st - 3rd** = 0.753 (n.s.)
	3rd	3.521	1.067	**2nd - 3rd** = 0.002
Reflective Thinking	**1st**	3.993	0.912	**1st - 2nd** = 0.773 (n.s.)
	2nd	3.939	0.862	**1st - 3rd** = 0.023
	3rd	3.581	1.069	**2nd - 3rd** = 0.090 (n.s.)
Relevance	**1st**	4.467	0.586	**1st - 2nd** = 0.643 (n.s.)
	2nd	4.411	0.530	**1st - 3rd** = 0.023
	3rd	4.152	0.898	**2nd - 3rd** = 0.075 (n.s.)
Complexity	**1st**	4.583	0.538	**1st - 2nd** = 0.100 (n.s.)
	2nd	4.756	0.400	**1st - 3rd** = 0.089 (n.s.)
	3rd	4.371	0.809	**2nd - 3rd** = 0.002
Challenge	**1st**	4.123	0.829	**1st - 2nd** = 0.097 (n.s.)
	2nd	3.839	0.760	**1st - 3rd** = 0.096 (n.s.)
	3rd	3.854	0.944	**2nd - 3rd** = 0.935 (n.s.)

*n.s.: not significant. Source: Elaborated by the authors.

Students' abilities to reflect upon their own learning (Reflective Thinking) and to choose their learning strategies, such as the preference for authentic environments that reflect real-life situations (Relevance), are connected to their ability to self-regulate their learning process. This process involves their active, constructive, and autonomous participation in their own learning. The self-regulation of learning refers to the degree by which students work at the metacognitive (knowledge and control of their own cognition), motivational (engagement in a specific task), and behavioral levels (choice of strategies, methods, and actions) to improve their own learning. This process is influenced by different factors, such as the students' psychological development, their

family and school experiences, gender, age, and school environment, among other factors (Hargis, 2001; Mateos, 2001; Silva, 2004; Silva et al., 2004; Zimmerman and Martinez-Pons, 1990).

Therefore, teachers should support educational strategies that help students self-regulate their learning. The experience with our multimedia learning laboratory showed that it is a favorable place to encourage the students' active and autonomous participation in their own learning. The laboratory is also a suitable place to stimulate the collaborative work among the groups of students. As argued by Chronaki (2004, p. 560), the learner is no more a "[…] passive recipient of information (or the consumer of prescriptive guidelines) but has the potential actively to interact with information technology tools and peers and to construct meaning via exploration, discovery, trial and error and social engagement".

3.1. Qualitative data: focused interviews with some students

During the biology classes, some students were interviewed regarding the multimedia learning laboratory, and the learning process that was happening in it. All students highlighted the motivational aspects of applying technology in education, and emphasized the interest and attraction that the laboratory aroused.

> […] In my own opinion, this laboratory presents a way of familiarization with the technology in education. We are immerse in the new technologies and we master it. So, if it is convenient, why can't we use technology in education? Wouldn't it make our learning more effective? The answer is simple: Yes. In addition to being useful and convenient, I can see that we are feeling attracted to this place. Basically, we are more comfortable in it (Pupil 1).

> […] This environment is a major innovation in the teaching method, a model for our country, because by using advanced technologies the students can discover new intellectual worlds. It also combines the teachers' skills with new technologies, which makes the classes more dynamic and fun for both learners and teachers (Pupil 2).

In the interviews, the students highlighted the Complexity, Relevance, and Reflective Thinking factors. Specifically, they pointed out their ability to use the technological resources available at the multimedia learning environment (Complexity - Ease of use), the authentic atmosphere of this place, and its potential to represent real-life situations (Relevance). They also emphasized that, at the multimedia learning laboratory, they could reflect about their own learning process and strategies (Reflective Thinking). These speeches corroborated the quantitative data, which showed that the Complexity and Relevance factors reached the highest averages, followed by Challenge and Reflective Thinking factors. Chuang and Tsai (2005) also obtained qualitative results that corroborated the quantitative ones, as most of the students demonstrated in the interviews that they preferred relevant and easy-to-use internet-based learning environments. These authors also found that some students emphasized the Reflective Thinking factor in the interviews.

> […] Technology is becoming an increasingly powerful tool to improve education. So, our laboratory is showing to everyone that it is possible to have a nice and different type of school while maintaining the quality of education. As a student, I am honored to be part of the early years of this project, as it has a lot of potential to innovate - and

> it has innovated - the current teaching methodologies, in addition to making the classroom a more dynamic, interactive, and attractive environment for both students and educators (Pupil 3).
>
> […] This biology class that I attended at our laboratory was really nice, because it allowed my teacher to address some contents in a more attractive way than in a common classroom. What made the lesson more interesting and pleasant was the fact that it broke up our routine (Pupil 4).

4. Final considerations

This research showed that the students have good perceptions about the laboratory. They highlighted that this environment has fun and easy-to-use resources (Complexity), is relevant and authentic (Relevance), challenging and useful (Challenge), and contributes to the reflection about their own learning (Reflective Thinking). In the interviews, they also emphasized the interest and attraction that the laboratory arouses, confirming the technology's potential to motivate them. This research also found that boys and girls have similar perceptions about the laboratory, and that students from different years of secondary education do not follow a pattern in their preferences.

This paper presents a preliminary study evaluating the educational contributions of a multimedia learning environment for secondary students, and the learning strategies that can be used to motivate them. Future works may evaluate the teachers' opinions about these environments to understand their expectations and concerns. Finally, we understand that it is important to promote reflections in our schools regarding the most effective learning strategies. We need to think about how can we attract our students' attention and develop their critical thinking. As taught by Freire (1987), this is the only way to promote emancipatory education in our schools.

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