

Teachers' Perception of the WEBMAT® platform

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Abstract

The current educational context entails new challenges and opportunities for educators and students. Among these are found the Information and Communication Technology tools (ICTs). They bring new paradigms to educational dynamics, as is the case of Digital Educational Books (DEB). Consequently, this study intends to access the perception of the user's experience (UX) in a group of teachers using the WEBMAT® educational platform. The data collected is based on the exploitation of a high-fidelity prototype, making it possible to evaluate how the principles of Design Interaction, applied to the development of DEB, provide support to the teachers in understanding and creating tasks. This study has provided data that is intended as a contribution towards improving the quality of these educational platforms as well as assisting educators in developing educational tasks.

Keywords:

educational technology; user experience (UX); interaction design.

Perceção dos Professores acerca da Plataforma WEBMAT

Resumo: O atual contexto educacional patenteia novos desafios e oportunidades a educadores e alunos. Entre estes encontram-se as ferramentas de Tecnologia de Informação e Comunicação (TIC), que implicam novos paradigmas nas dinâmicas educacionais, tais como os Cadernos Didáticos Digitais (CDD). Nesse sentido, este estudo pretende perceber a experiência de utilizador (UX) num grupo de docentes na utilização da plataforma educacional WEBMAT®. Os dados recolhidos tiveram por base a exploração de um protótipo de elevada fidelidade, possibilitando avaliar de que forma os princípios de Design de Interação, aplicados no desenvolvimento de CDD, apoiam na compreensão e criação de tarefas por parte dos docentes. Este estudo providenciou dados que pretendem ser uma contribuição para a melhoria da qualidade no desenvolvimento destas plataformas didáticas, assim como auxiliar os educadores no desenvolvimento de tarefas educativas.

Palavras-chave: tecnologia educativa; usabilidade; experiência do utilizador (UX); design de interação.

La perception des enseignants vis-à-vis la plate-forme WEBMAT

Résumé: Le contexte éducationnel actuel apporte de nouveaux défis et opportunités pour des éducateurs et des élèves. Parmi ceux-ci nous trouvons les outils de Technologie d'Information et Communication (TIC), impliquant de nouveaux paradigmes dans les dynamiques éducationnelles, comme les Cahiers Didactiques Numériques (CDD). En conséquence, cette étude vise à percevoir l'expérience de l'utilisateur (UX) dans un groupe de professeurs utilisant la plate-forme éducationnelle WEBMAT®. Les données collectées ont été basées sur l'exploitation d'un prototype d'haute fidélité, permettant d'évaluer la manière dont les principes de Design d'Interaction, appliqués au développement des CDD, offrent support dans la compréhension et création des tâches pour les enseignants. Cette étude a fourni des données destinées à être une contribution pour améliorer la qualité dans le développement de ces plates-formes didactiques, ainsi que pour aider les éducateurs dans le développement de tâches éducatives.

Mots-clés: technologie éducative; utilisabilité; expérience de l'utilisateur (UX); design d'interaction.

La percepción de los maestros con respecto a la plataforma WEBMAT

Resumen: El contexto educativo actual conlleva nuevos retos y oportunidades tanto para los educadores como para los alumnos. Algunos de estos, están representados por herramientas como la Tecnología de la Información y la Comunicación (TIC), que implican nuevos paradigmas en la dinámica educativa, tal como los Cuadernos Digitales Didácticos (CDD). Por lo tanto, presentamos este estudio que proyecta exponer cómo perfeccionar la experiencia del usuario (UX) en un grupo de profesores utilizando la plataforma educativa WEBMAT®. Los datos recogidos se basan en el empleo de un prototipo de alta fidelidad, que nos permite evaluar de qué manera los principios de diseño de la interacción, aplicados en el desarrollo de los CDD, ayudan a los profesores en el proceso de comprensión y creación de tareas. Este estudio ha proporcionado datos que pretenden aportar una contribución a la mejora de la calidad en el desarrollo de estas plataformas de aprendizaje, así como asesorar a los educadores en el desarrollo de tareas educativas.

Palabras clave: tecnología educativa; usabilidad; experiencia del utilizador (ux); diseño de interacción.

Introduction

Education in a school context is an activity that is in constant mutation adapting to the respective eras or trends. This fact is notorious with the integration of information and communication technologies (ICT) in the educational context. This occurrence is not exclusively due to political decisions, but also to the fact that technologies are playing an increasingly vital role in the everyday lives of people. Another factor that contributes towards this integration is the incentive given to the autonomous work of students (Moreira and Balula, 2010). ICT should have as main objective aiding in the educational process, because according to Neri de Souza and Bezerra (2013), they allow for the diversification of strategies in order to provide a fertile moment for reflection of several educational practices in the school context, leading to an active learning. This way the educator shall enjoy a wider range of methodological options that allow one to find the most appropriate communication strategies with students through the various technologies that they have available (Lucas, 2009).

Some authors, such as Osório (2011), Musawi (2011) or Neri de Souza and Bezerra (2013), have evidenced the importance that ICTs have in stimulating and developing cognitive skills, it not being any surprise that for 14 years, school book editors in the United States have begun to bet on digital versions (e-books) of their manuals destined to university education (Woody, Daniel, and Baker, 2010). According to Woody et al (2010) e-books have gained many supporters, at least as regards reputation. The same authors sustain this idea because of the flexibility and accessibility of e-books in relation to the traditional paper books, as well as to the call on the visual sense (through graphics in movement, video clips) or due to the possibility of adding support material, whether in audio, links for activities or website (Woody et al., 2010).

We can find in authors such as Young (2010), Wright, Neugent, and McGraw (2011), Weider (2011), Uluylol and Agcan (2012), Ross & Johnson (2012), Wells (2012) and Neri de Souza and Mol (2013), the first studies related to the integration of e-books in an educational context. Among these studies, the most important ever made, were developed by the Department of Education of Virginia (Ross & Johnson, 2012; Wright et al., 2011). In one of these studies, Wright et al. (2011) reveals that "most students clearly liked the e-book's ability to support individualised learning. The vast majority of students reported that they felt comfortable reading and using an e-book "(p. 10).

With the increased massification of tablets, most educational content of publishers begins to increasingly invest in titles that can be bought and read using these digital tools (Young, 2010). However is this a propitious time for

replacing the Educational Paper Booklets (EPB) for Digital Educational books (DEB)? Should this replacement be progressive or fast? Are the students and teachers motivated and prepared for its implementation in the education system? According to Shepperd, Grace, & Koch (2008) educators should be cautious and not rush the adoption of DEB in a classroom context. This statement is justified by the authors due to the fact that in their study students do not favourably assess the DEBs, comparatively with the EPB.

But how can we understand that a generation of digital natives demonstrates an apparent resistance in relation to the use of MED? Woody et al. (2010) points to one of the possible justifications for this fact, when alleging that the development of the project of a DEB will be able to have a different development of an EPB, in order to enable the user to have a more constructive experience. As such, it seem to be fundamental the role of two distinct groups in this process of integration of the DEB in education: the authors/editors of the DEB and the teachers and students, users of the DEB. The authors/publishers because, as content creators for the DEB, need to know and understand the educational and interactive processes and strategies that can provide educators and students an efficient integration of DEBs in schools. The teachers, because they have their responsibility, their dynamics and the guidance of the class, whilst students are users and the focus of development of these products. As such it is pertinent that the teachers are bearers of knowledge inherent to using these digital tools, as well as be aware of the appropriate pedagogical strategies, in order to take advantage of the intrinsic potential of the DEBs for the ultimate goal which is the learning of students. However it is important not to overlook the role that Interaction and Design (ID) may have in this process. According to Filatro (2010) it is possible to offer relevant learning experiences if the educational designed product is essentially interactive. The same is confirmed by Preece, Rogers and Sharp (2002) when stating that ID seeks to develop products whose main features are ease, pleasure and the effective use of these same products. Therefore, the study of the ID principles is essential when we theorise the integration of Didactic Books in digital format in the educational process.

Resulting from this context, the present study aims to investigate what challenges Digital Education Books (DEB) pose to teachers, as regards the level of user experience (UX), as well as empower them by giving them a convenient integration into the context of teaching and learning. To this end, this study aims to develop a research that helps: a) i) to understand the difficulties of teachers at a UX level on a first contact with the WEBMAT® platform; ii) to identify improvements to be proposed, through usability evaluation, in order to

enable improvements to educational platforms at the level of Interactive Design. Achieving these goals will help you understand what the UX of teachers is in initially using WEBMAT®, thus enabling educational content creators, enhance the development of efficient tools tailored to the educational needs of students and teachers.

1. Usability and User Experience (UX)

Taking into account the emergent use of digital tools in an educational context, it is necessary to ponder its efficiency, not only in the interaction with students, but in what is more important, in learning. Recent studies, such as that of López Simó & Casulleras (2013), point out the difficulties encountered by secondary school students in reading and understanding the representations of images on monitor screens. It is in the search for solutions that can address these difficulties that arises the concept of usability, presenting itself as a standard that a "product" should reach in order to provide users with the achievement of specific objectives in an efficient and satisfactory manner, in a particular context of use (ISO, 1999). Usability proposes that developed resources are characterised for being effective, efficient and safe in their use, as well as useful, of easy memorisation and learning in their use (Preece et al., 2002). However, the goals of usability of an application are characterised for being more objective and concerned with how users interact with a "product", being able to differentiate itself from the user experience goals (Preece et al., 2002). ISO 9241-210:2010 states that the User Experience (User Experience-UX) is related to the feedback of a person resulting from the usability of a product or system. This feedback can be characterised for its preferences, perceptions, emotions, beliefs, physical and psychological reactions, behaviours and user actions that occur before, during and after the use of a particular product (ISO, 2010). Apparently these two concepts (usability and user experience) seem to be antagonistic, as one is characterised by its rationality and the other by its apparent emotionality. It is in this juncture that fits the challenge of developing "interactive educational applications," these applications being characterised by its good usability and by simultaneously providing a pleasant and efficient experience to users. However the focus on developing interactive educational resources is constantly centred on satisfaction and experience that this provides the user, hence it is important to be knowledgeable of the user experience in interaction with a particular application (Preece et al., 2002).

2. The WEBMAT® plataforma

The WEBMAT® Platform - Materials that can be manipulated were developed by Ludomedia, a company of didactic and leisure contents, and is a product that offers a service that turns it into a strategic educational support articulator for educators. It is characterised by being a resource for the development of tasks in the area of mathematics and which can be used by both teachers and students in pre-school, elementary education and others. In its essence the WEBMAT® allows the user to create tasks based on materials that can be manipulated, among which: logical blocks, Cuisenaire, geometric blocks, poliminos, coloured tiles, geoboards and tangram (Ludomedia, 2014). The WEBMAT® also enables the recording of tasks created online, and these may be accessed anywhere. Currently as a prototype of high fidelity is available, which allows to evaluate the educational and technical worth through its users.

Figure 1. Example of WEBMAT® working environment.



The building process of WEBMAT® is based on the Hybrid Methodology of User-Focused Development (A. P. Costa, Loureiro, & Reis, 2010; A. P. Costa, Reis, & Loureiro, 2014) and proposed by Costa (2012). According to this author, "user involvement in the development process provides a source of knowledge about the context of use, tasks, and the way in which users tend to later work with the software" (pg. 182). This methodology privileges the integration of users in the early stages of the development process of a product. Accordingly, and with a view to obtaining data that would allow us to establish how users explore the platform, we decided to adapt this methodology, which facilitates the collection of evaluation data from usability and the UX.

Figure 2. WEBMAT® tools.

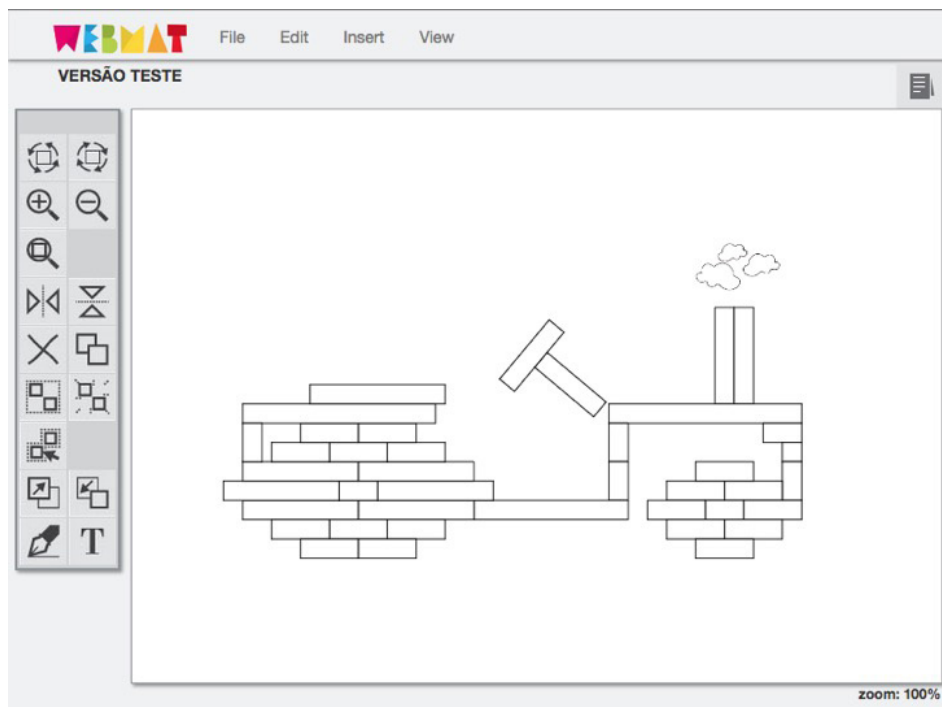
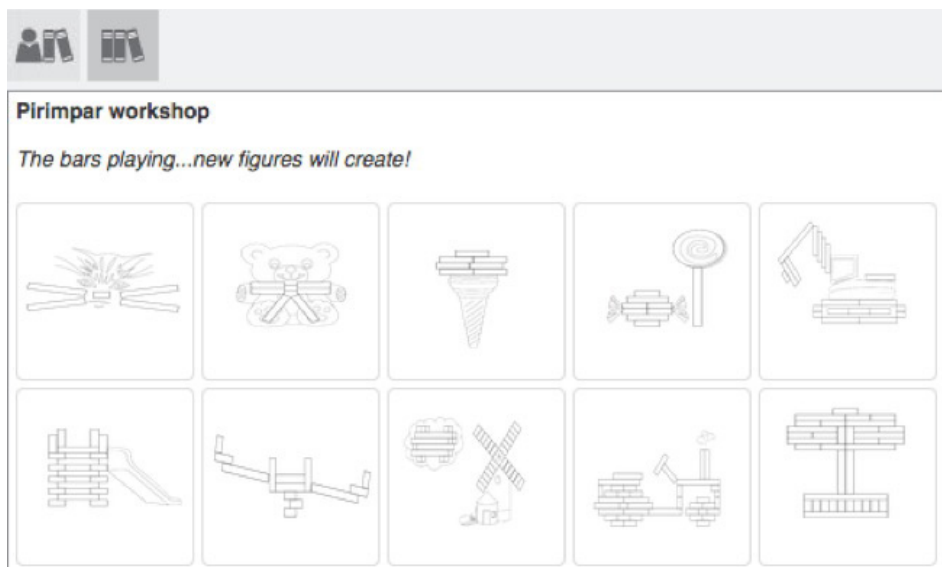


Figure 3. WEBMAT® activities library.



3. Method

This study seeks to enable exploitation of the meanings of interactions through the interpretative paradigm and thus encourage the qualitative nature of the investigation (Coutinho, 2008). The same is sustained in a data collection carried out in the course of a workshop in which Cuisenaire easy to manipulate material was explored through the WEBMAT platform. This workshop, had a duration of 120 minutes and was attended by 30 teachers. It should be noted that the WEBMAT® platform is in the testing phase, having this workshop served to evaluate the platform in order to correct possible errors and thus integrate users in the evaluation and development of the tool.

After the workshop a questionnaire was undertaken that would allow for collecting data on three factors that, according to ISO 9241-210: 2010, can influence the user experience: the system, the user and the context of use (ISO, 2010). The questionnaire was divided into three parts: the first related to the characterisation of the teacher (age, gender, academic background, an activity that carries out, familiarity with ICTs in the educational context); the second related to the usability and user experience (interface and WEBMAT® browsing); and the third linked to technical and pedagogical aspects of WEBMAT® (positive and to be improved) as well as those of particular interest to be applied in the educational context.

The data collected was subsequently analysed using two data assessment tools, SPSS® for the quantitative analysis of data and the webQDA® for the qualitative data.

4. Results and Discussion

As already mentioned the evaluation of teachers on the WEBMAT® platform was supported by completing a questionnaire. This questionnaire was completed at the end of a *workshop* and in which teachers attended an exhibition (an explanation on the operation of the platform) and a practical part where the teachers made an initial use of the platform. At the end of the workshop, the survey by questionnaire was applied.

For the closed questions of the questionnaire, the analysis used was the *Likert* scale: 1- Strongly Disagree, 2- Disagree, 3- No opinion, 4- Agree, 5- Completely agree.

It was found that, of the 30 teachers who participated in this study, 12 were teaching in pre-school education, 8 did not lecture at the time, 6 lectured in Elementary School, 2 in Higher Education, and 1 in Secondary School. As regards

the professional experience most teachers have less than 10 years of service, and 4 teachers had master's degrees and 2 had PhD's As regards gender, 25 teachers were female (83%) and 5 were male (17 percent).

It was found that all teachers used the computer in their daily life, and showed that were familiar with the use of computer equipment. Table 1 presents the level of involvement of teachers in ICT-related activities in the context of education. To this end it was considered that the involvement of at least 1 or 2 projects / activities, as being "*With Some Involvement*" and being involved in 3 more projects / activities, as being "*Very Involved*".

The results revealed that 17 of the 29 teachers (one teacher did not answer the question) did not have any involvement with the use of ICT in their teaching practice, and that Pre-School teachers were those less involved. These results open up a new line of research, however we can infer that this low involvement does not occur only due to lack of investment in the integration of ICT tools in this level of education. This may also be justified by the predominance that the manual nature of activities have in Pre-school education.

Table 1- Involvement of teachers in activities with ICT resource

Involvement in activities using ICT in a teaching context	Level that teaches						
	Preschool	Primary School [1st Cycle]	Elementary School [2nd Cycle]	Secondary School [3rd Cycle]	Secondary	Higher	Other
Without involvement	7	2	1	1	0	1	5
With Some Involvement	1	3	0	0	0	0	0
Very involved	4	1	0	0	0	1	2
Total	12	6	1	1	0	2	7

Tables 2, 3 and 4 present the results for the closed questions which are directly related to usability and user experience (interface and navigation in WEBMAT®).

In the opinion of the majority of teachers questioned, WEBMAT® proved to be a simple system to use and did not present difficulties in learning, whereby 63 percent agreed and 27 percent totally agreed that WEBMAT® was easy to learn, while 10% disagreed. As regards a system with a tendency to be confused 70% disagree or completely disagree, however 13% had no opinion and 17% agreed in saying that the system was confusing

Overall, 83% of respondents disagreed in classifying the platform as being difficult to use. Such data appear to be promising with regard to usability present on this platform. However, 17% of teachers expressed their agreement

to classify WEBMAT® as difficult to use, repeating the trend reflected in the response related to the fact that the system tends to be confusing. At first sight we could agree that these values indicate that there is still some work to be done in this field, in particular when we have a view to achieving good usability indexes in a system, however it should be taken into account that the WEBMAT®, as has been said earlier, is still in the testing phase, whereby these values can be a reflection of this period of development. However, the platform already globally patents good usability indexes for its users.

Table 2 - General evaluation on the usability of the WEBMAT®

	STRONGLY DISAGREE	DISAGREE	NO OPINION	AGREE.	COMPLETELY AGREE
The system tends to be confusing	6 (20%)	15 (50%)	4 (13%)	5 (17%)	0 (0%)
It was easy to learn to use the WEBMAT®	0 (0%)	3 (10%)	0 (0%)	19 (63%)	8 (27%)
I felt that the WEBMAT® was difficult to use	10 (33%)	15 (50%)	0 (0%)	5 (17%)	0 (0%)

Table 3 shows the evaluation of the teachers from a platform navigation level. The main highlight goes to around 87% of the 30 teachers who disagreed or totally disagreed when faced with the question as to whether the organization of the information screen was confusing. This data indicates that at a level of understanding and navigability of the organisation of the workplace, the WEBMAT® already displays good satisfaction indicators at a UX level on behalf of teachers. These indicators are also supported with 60% of teachers who expressed agreement by the clear manner in which one can navigate the screen. This data is confirmed with the answers of teachers to the question related to the "Help" function, which was considered unnecessary for the majority of teachers (53%), while 37% agreed or totally agreed with the need for the "Help" function.

The point that obtained a greater split in opinions is related to the speed of the system. Around 50% did not find the system slow, while the remaining 50%, either did not have an opinion (30%) or agreed with the statement. The fact that WEBMAT® works exclusively *online* can be a constant variation factor towards the speed system, since the same will depend on the bandwidth of the place where it is accessed.

Table 3 - Technical evaluation of WEBMAT® on the navigability

	STRONGLY DISAGREE	DISAGREE	NO OPINION	AGREE.	COMPLETELY AGREE
The speed of the system is slow	2 (7%)	13 (43%)	11 (37%)	3 (10%)	1 (3%)
I felt the need to use the "help" function	7 (23%)	9 (30%)	6 (20%)	5 (17%)	3 (10%)
The way in which one can navigate the screen is clear	0 (0%)	4 (13%)	8 (27%)	15 (50%)	3 (10%)
The organisation of information on the screen was confusing	9 (30%)	17 (57%)	2 (7%)	1 (3%)	1 (3%)

Analysis of table 4 enables the checking of data related to the user's emotional side (UX). It appears that 93% of teachers felt that their reaction was positive during the execution of tasks, and 84% have reinforced this view by stating that they feel encouraged to use the WEBMAT®. In this data is particularly relevant, if we take into account that the user experience goals (Preece et al., 2002), are mainly supported by the user's emotional aspect reflected in the use of a system. One can understand that according to this data, teachers feel emotionally satisfied in the course of using the platform, which in light of the UX goals show that the system provides a good user experience.

Table 4 - Emotional evaluation of the use of WEBMAT®

	STRONGLY DISAGREE	DISAGREE	NO OPINION	AGREE	COMPLETELY AGREE
My reaction in using WEBMAT® was good	0 (0%)	1 (3%)	1 (3%)	18 (60%)	10 (33%)
I felt frustrated when using the WEBMAT®	13 (43%)	4 (13%)	3 (10%)	8 (27%)	2 (7%)
I felt stimulated when using the WEBMAT®	0 (0%)	2 (7%)	3 (10%)	17 (57%)	8 (27%)

However, with the issue "I felt frustrated when using the WEBMAT®", 34% of teachers expressed their frustration. This percentage seems to challenge the answer to the question "my reaction in using the WEBMAT® was good", where the majority of respondents (93%) assessed it as being positive. The answer to this apparent paradox can be found in table 5. These data, along with the data in table 6 were obtained through open questions and were qualitatively analysed. Table 5 respondents were asked about the difficulties experienced during the use of the platform. Answers were classified into four categories: i) "Without any Difficulties"; ii) some "Technical/software" difficulties; iii) difficulties in "Interacting" (related to the block on interaction in the context of the classroom); and iv) difficulties "Understanding the Tool". The overwhelming majority of reported difficulties involved technical issues/software (N=19).

"The difficulties that I felt were related to flaws that the platform still has, in particular in the execution of some commands." Teacher 2

"The difficulties were related to minor "bugs" in the system itself, which may have been caused due to rupture in internet network access or even failure in the response of commands." Teacher 16

"I felt more difficulties in the practical part, not so much in understanding the tasks but in executing the same because the platform was constantly blocking." Teacher 18

"Since it is an experimental software, I felt a little frustrated because sometimes the software did not respond to my commands: it made my profile disappear several times and I had to go back and rebuild it." Teacher 4

Regarding the frustration expressed by these teachers (Table 4) the same appears to be correlated with the technical anomalies expressed in Table 5 and in the reports of respondents, as shown in the answers of "Teacher 4".

Other teachers also reported 3 cases related to difficulties in interacting with WEBMAT® in the course of executing tasks.

"(...) one cannot select all of the pieces at once, it is necessary to select one at a time. And the fact that the parts overlap also hinders the execution of tasks" Teacher 3

"Some icons are unclear" Teacher 12

On the other hand, teachers who stated that they did not encounter any difficulties (9 altogether) justified their answers for the prior knowledge that they had of the platform (Teacher 3) or by the efficient manner in which WEBMAT® was presented, in the theory part of the workshop (Teacher 7).

"I did not feel any difficulties as it was a material that I was familiar with". Teacher 3

"I did not feel any difficulties, the theory part was presented in a simple and practical manner facilitating the use of the application." Teacher 7

Table 5 - Technical evaluation in relation to the difficulties experienced in using WEBMAT®

WITHOUT DIFFICULTIES	TECHNICAL / SOFTWARE	INTERACTION	UNDERSTANDING THE TOOL
5	8	0	0
3	2	2	0
0	1	0	0
0	1	0	0
0	0	0	0
0	2	0	0
1	5	1	0
9	19	3	0

In conclusion, table 6 reveals the resources that teachers identified in WEBMAT® and which intend to promote the educational context. Answers were classified into five categories of resources: "No" resource; "Interactive" resources; "Cognitive" resources; "Technical" resources; and "Creative" resources. The resources that were more often referred to were the "Cognitive" ones, with 16 references and the "Technical" resources with 11 references.

Table 6 - Assessment of WEBMAT® resources with potential for promotion in an educational context

WEBMAT® RESOURCES THAT IT INTENDS TO PROMOTE				
NONE	INTERACTIVE	COGNITIVE	TECHNICAL	CREATIVE
2	1	5	6	2
0	0	1	0	1
0	0	5	2	1
1	0	0	0	0
0	0	0	0	0
1	0	0	1	0
2	1	5	2	1
6	2	16	11	5

As regard "Cognitive" resources, teachers said they intended to "Explore mental calculus skills" (Teacher 1), "(...) Geometric Transformations: reflection" (Teacher 6) or the "Development of logical concepts. Development of numerical concepts (counting, serial numbers, arithmetic operations)" Teacher 7. These responses seem to indicate that teachers understood, through interaction with

the tool, the didactic potential of the same. "Technical" resources were also evidenced by the respondents, as a possibility to "(...) *building profiles, symmetries*" (Teacher 6), or "*Using Cuisenaire on the platform*" (Teacher 11).

Conclusion

This study proposed to understand the difficulties felt in the usability and UX of teachers, during initial use of the WEBMAT®, with a purpose of identifying improvements to be implemented in the development of the respective platform. This development is sustained in a user-centred methodology, having been relevant towards the contribution of this study in that process.

Following analysis of the data collected it is possible to deduce that, at the level of User Experience (UX), there were no difficulties felt by teachers in using the WEBMAT®, and there was even some comfort and encouragement revealed in the use of the platform. Based on these facts it is possible to state that the WEBMAT® platform, although still in its testing stage, already shows good usability indexes, thereby providing teachers a satisfactory User Experience.

The main difficulties found relate to the solidity of the software, anomalies only having been reported as regards system stability; such anomalies being related to the fact that WEBMAT® is still running on a test version. Despite these irregularities, teachers were shown to demonstrate, identify, understand functions and the didactic potential of the platform, to be applied in the educational context.

As improvements to be applied on the usability level of the WEBMAT® and user experience, in addition to the system stability issues already mentioned, teachers have identified some limitations related to the interaction in the course of some operations, essentially as regards the possibility of selecting multiple objects, cloning or identifying some icons.

Taking into account that WEBMAT® is only available for testing on personal computers, this study was limited to analysing the usability and user experience occurring following the use of this platform, it being expected and necessary, in the near future, to evaluate and analyse the usability and user experience of WEBMAT® in tablets. This need is justified with the massification of this technology in today's society.

Some of the results presented bring about other issues that may be answered in future studies, such as the relationship that may exist between the technical difficulties and identified usability and the level of ICT competence (Costa et al., 2008) of the user.

It is believed that the results obtained from this study may be contribute towards improving the development of this platform in terms of user experience, making it more efficient and adapted to the educational needs of students and teachers.

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