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This research presents an international community of practice for teachers using the VISIR remote lab. Throughout the research, it was necessary to study about communities of practice and their potential use in remote laboratories; identify practices with collaborative potential in the institutions and with the participating teachers; develop the necessary technological environment to support the proposed community of practice; validate the proposal with four institutions (four countries - Brazil, Portugal, Spain and Argentina) to evaluate the proposed model. The motivation for developing this research came from the history of the Remote Experimentation Laboratory (REXLAB) with the project VISIR+: Educational Modules for Electric and Electronic Circuits Theory and Practice following an Enquiry based Teaching and Learning Methodology supported by VISIR+". The VISIR + project is an international cooperation project with the participation of 21 Ibero-American partner institutions between October 2015 and April 2018. The platform, called Labs4STEAM, was developed using Dokuwiki, an open source wiki software that contains a large number of plugins. From the data collection it was possible to receive a mostly positive feedback, but several improvement opportunities were pointed out, which will be performed soon. Thus, from the developed platform one can plan future work, taking into account the results obtained and experience and partnerships with the VISIR + project.

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1. Introduction

The popularization of Information and Communication Technologies allows the creation and discovery of new tools and possibilities previously difficult to explore, as digital resources break down barriers such as distance, time and space (SILVA ET AL, 2019). One of the biggest opportunities was the opening of new online applications in network environments (DIONIZIO ET AL, 2018). The Internet is today the most widely accessed platform that millions of people today, anywhere, anytime access daily (RODRIGUES, 2018).

Tools that provide teacher-focused collaborative environments enable teachers to work together to share classroom experiences. Therefore, participation in a community expands the innovative potential of a teacher who already has access to technology and facilitates the process of adapting a lay teacher in relation to these resources, as there is a whole new possibility for discussion, exchange of tips and learning (FERREIRA E SILVA, 2014).

One of the clearest definitions of the concept of Community of Practice (CoP), which is widely

cited, was elaborated in a research by Étienne Wenger (2002), creator of the concept. This definition states that communities of practice are groups of people who share an opinion, a set of problems, or an admiration for a topic in order to deepen their knowledge and experience in this area through interactions with others. (WENGER, MCDERMOTT E SNYDER, 2002). Thus, the concept of communities of practice covers a peer work perspective, as opposed to an individualistic perspective.

For Mikkelson (2016), the establishment of communities of practice allows the socialization of knowledge in order to positively modify the performance of organizations. In addition, this type of practice enables all members of a team to be able to understand the roles of other members in order to avoid miscommunication, which often happens when an individual does not know who to contact during a moment of doubt (QUIGLEY, 2015).

For Williams (2016), communities of practice are groups of people who share a skill or profession and are created specifically for the purpose of gaining knowledge and improving practices related to their area of knowledge. Smith, Hayes, and Shea (2017) define community of practice as a knowledge management approach applicable to a variety of contexts, including organizations, organizational design, government, education, and civic life.

The construction of the concept of communities of practice is based on learning and its dimensions and can be seen as a social learning system (FERNANDES ET AL, 2016). For Wenger (2010), social scientists have used versions of the concept of communities of practice for a variety of analytical purposes, even though their origin and use of the concept are found in the area of learning theory.

Therefore, the concept of community of practice fits in well with the development of a collaborative online environment suitable for teachers, since the framework allows teachers to interact both teaching and learning, allowing them to share their own experiences, also understand your colleague's experience and know how to replicate it, advise it, and work not only in a team but in a community way.

Participation in a community expands the innovative potential of a teacher who already has access to technology and facilitates the process of adapting a lay teacher in relation to these resources, as there is every possibility of discussion, exchange of tips and learning. Registered teachers can submit their classroom practices to the environment and other teachers can access them and talk about their application.

From the research, we sought to develop a tool for teacher interaction, allowing teachers to share lesson plans with partners from different parts of the world, and sharing experiences. Initially, the platform was designed to house lesson plans that made use of the remote VISIR laboratory, a tool aimed at supporting the teaching of theory and practice in electrical and electronic circuits. However, it became more interesting to expand the platform's audience, making room for lesson plans that made use of not only other remote labs, but also simulations.

A remote laboratory is a type of experimentation in which the experimental apparatus and the user are physically separated, and the execution of the experiment depends on a means of communication (Internet) between the user and the remote laboratory, usually through a user interface (FIDALGO ET AL, 2014). Therefore, a student accessing a remote laboratory will have an experience very similar to that of accessing a traditional laboratory, since the result of his experimentation will vary depending on the current conditions of the environment where it is applied.

The remote laboratory, which aims to support the teaching of theory and practice of electrical and

electronic circuits, was widespread throughout Europe, so teachers using the tool had a lot of experience to add to new teachers. From this assumption came the idea of spreading the use of VISIR in Latin America.

The VISIR + project was an international collaboration project supported by the European Commission under contract 561735-EPP-1-2015-1-EN-EPPKA2-CBHE-JP in the Erasmus + program during 2015 to 2018. The project was started at the Blekinge Institute of Technology (Sweden) to disseminate the use of the VISIR remote laboratory to Latin America.

Among the institutions selected for participation in the project were the European Polytechnic Institute of Porto (IPP) in Portugal; Blekinge Institute of Technology (BTH), Sweden; National University of Distance Education (UNED) and University of Deusto, Spain. Among the Latin American institutions were the Brazilian Federal University of Santa Catarina (UFSC), the Federal Institute of Santa Catarina (IFSC) and the Pontifical Catholic University of Rio de Janeiro (PUCRJ) and the Argentine National University of Rosario (UNR).

At the Federal University of Santa Catarina, work on VISIR + was carried out within the Remote Experimentation Laboratory (RExLab), a research group founded in 1997 to promote the use of educational technologies and digital inclusion.

This research aims to present the development and testing of a virtual practice community aimed at teachers of STEAM (Science, Technology, Engineering and Mathematics) disciplines in order to promote discussion and sharing of lesson plans among teachers. On this platform, called Labs4STEAM (Labs for STEAM), teachers from around the world can submit their lesson plans, download class plans from classmates and discuss online. The elaboration of the platform allows the sharing of lesson plans that make use of both VISIR and other remote labs and even simulations. The tool allows knowledge and practice sharing, allowing a bridge between several educational institutions around the planet. Therefore, such a tool opens an opportunity for sustainability of the VISIR + project.

2. Methodological procedures

This section aims to present the methodological procedures taken to carry out the present research.

2.1 Classification of the Research

The table below presents the procedures adopted. Thus, it is expected that, with the information presented here, the study will be understood more clearly and can be replicated more easily by other researchers:

ASPECTS	CLASSIFICATION
Nature	Applied research
Problem Approach	Qualitative research
Objectives	Exploratory research
Technical Procedures	Bibliographic research and case study

Table 1. Classification of the Research

Considering the nature of this research, it fits in as applied because it is concerned with the generation of knowledge to solve real-life problems, involving local truths and interests (PRODANOV E FREITAS, 2013).

Qualitative research somehow establishes "a dynamic relationship between the real world and the subject, that is, an inseparable link between the objective world and the subjectivity of the subject that cannot be translated into numbers" (SILVA E MENEZES, 2005, p.20). In this category, the environment itself is considered a direct source for data generation and the researcher, a key instrument (PRONADOV E FREITAS, 2013).

Regarding the classification of the research according to its objectives, Gil (2002) and Silva and Menezes (2005) classify the research into three major groups: exploratory, descriptive and explanatory. According to Gil (2002), the explorations aim to make the problem more familiar, making it more explicit to the researcher. Freire (2013) agrees by explaining that this type of research promotes a first contact with the theme, seeking to clarify the related facts and phenomena. Usually this type of research is performed when there is little knowledge about the subject (ALMEIDA, 2011).

Corroborating with the authors Marconi and Lakatos (2010, p.158), the bibliographic research is seen as "a general overview of the main works already carried out, of important importance, for being able to provide current and relevant related data". In Freire's (2013) view, the bibliographic survey is intrinsic in scientific research, thus, all academic works are somehow framed as bibliographic. In this sense, this work is intrinsically linked to this procedure.

Given the profile of the activities developed, it is possible to define the research regarding the technical procedures as "case study", although the research provides interaction between the researchers involved in the investigated situations, which could also allow its classification as a "participant research". According to Yin (2010), a case study is an empirical research that investigates a contemporary phenomenon within its real life context, especially when the boundaries between the phenomenon and the context are not clearly defined.

2.2 Research steps

The following figure presents the search steps:

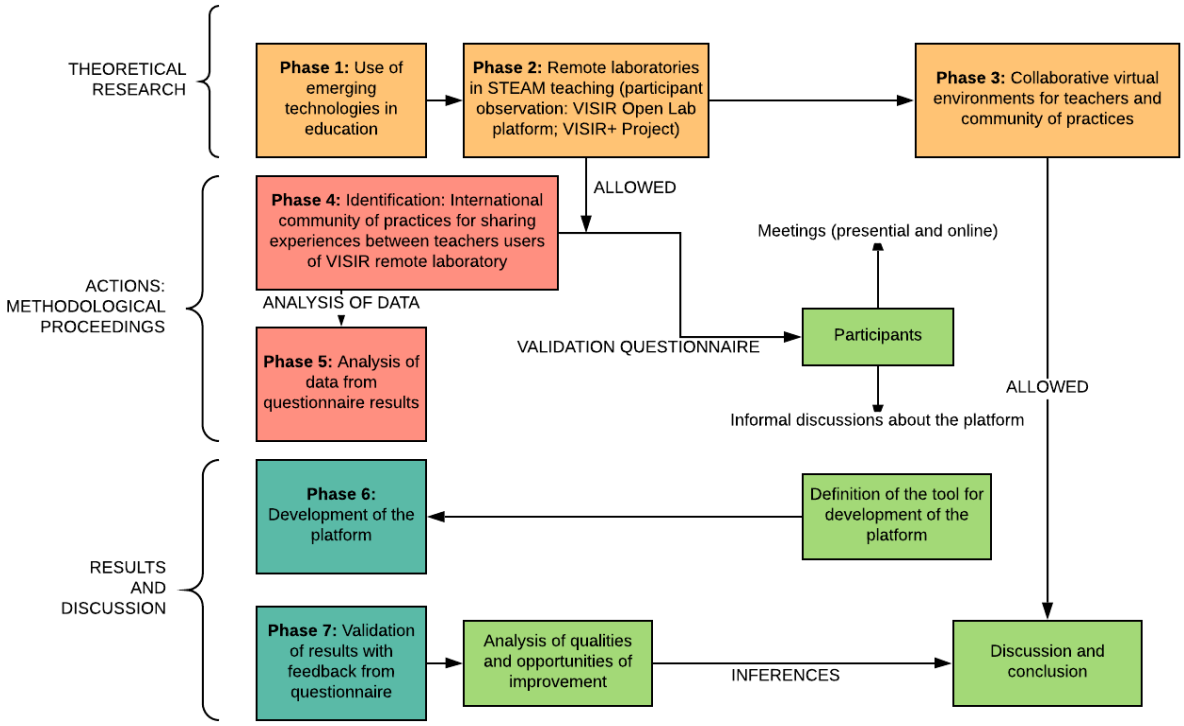


Figure 1. Research Steps

The first stage was dedicated to prepare a bibliographic foundation for the research base. Research was conducted on the main concepts related to this work, such as Communities of Practices, Remote Laboratories, Collaborative Virtual Platforms, among others.

Simultaneously, it was time to begin the elaboration of academic works related to the process of development of this work, reporting from the results of the bibliographic research, to the development of the platform, among other themes identified as relevant for publication.

After the bibliographic research was elaborated, it was possible to start the development process of Labs4STEAM.

Right after having this initial idea of the platform, it was time to make an initial contact with potential partners. To this end, a series of field research was carried out in order to hold meetings on the sustainability of the VISIR + project, where the need to create a platform for sharing practices with the remote VISIR laboratory was fitted.

After the development of the platform and initial contact with partners, it was time to apply the platform test questionnaire sent to all experts involved with its use. Soon after receiving all the answers, it was time to analyze and tabulate them.

With the conception of the results, it was time to write the conclusion of this work. After the conclusion of the conclusion, it was possible to prepare academic papers for publication based on the results of this study.

2.3 Procedures: Data Collection

The data collected for the research were collected from the case study. Thus, the data were analyzed in the qualitative analysis style.

According to Gil (2007), the analysis process allows the researcher to understand the phenomenon

by examining the situations that involve it.

Thus, to achieve the objectives proposed in this research, a questionnaire was prepared based on the work "Guidelines for the Evaluation of the Learning Objects Usability" (SILVEIRA E CARNEIRO, 2012). The authors of this paper have developed guidelines based on theoretical studies and learning object analysis by a technical team and teachers involved in the production of learning objects. From a theoretical framework study and case study with teacher training, a list of guidelines for the evaluation of the usability of learning objects was elaborated (SILVEIRA E CARNEIRO, 2012).

Silveira and Carneiro (2012) on the elaboration of the guidelines:

> The production of Oas can be performed using various conceptual, pedagogical or operational models, depending on the scope and institutional arrangements of the producing entity. In the context of this work, seven conditions are considered for a given educational resource to be considered a learning object and, based on these essential conditions, the guidelines for evaluating proposed learning objects were organized.
> (SILVEIRA E CARNEIRO, 2012, p.4)

The "Clearly explain a pedagogical objective" guidelines provide clear guidelines for the student to know what they are expected to learn to use the learning object and the teacher (unlike who produced the object) to know how to use it (SILVEIRA AND CARNEIRO, 2012).

The following are the guidelines:Apresentar uma contextualização inicial, descrevendo o tema/conteúdo tratado no objeto

- Present the pedagogical objective related to the use of the object
- Present the expected usage context for the object
- Highlight how the object could be pedagogically explored
- Provide supplemental material, preferably from the authoring team
- Among others

The guidelines related to "Prioritize the digital" prioritize the development of learning objects that do not need, for their use, application or program that is not freely available on the web (SILVEIRA E CARNEIRO, 2012). The following are the guidelines:

- Explain what software is required for object execution
- Take accessibility issues into account, enabling keyboard navigation
- Take accessibility issues into account, allowing the object to work in different browsers (or alerting the user if it does not)
- Avoid making available files (only) in PDF format, for presentation of the object and / or material complementary to its use, which are inaccessible via screen readers.
- Avoid providing external links that are not authored by the production team and thus cannot guarantee their permanence over time.
- Among others

The guidelines related to "Providing assistance to users" provide user assistance via the interface and easily accessible instructions (SILVEIRA E CARNEIRO, 2012). The following are the guidelines:

- Provide clear indications on how the object is used, indications available on the user interface itself and / or easily accessible from it.
- Use language appropriate to the user type and object application domain
- List specific (domain) terms when the objective is to broadly diffuse the object and it can be used in different areas.
- Provide short and explanatory statements
- Present constructive error messages that allow the user to redo their choices without interrupting the use of the object.
- Among others

The guidelines related to "Providing interactivity" provide error prevention (disabling what cannot be done, presenting specific data entry formats when necessary) (SILVEIRA AND CARNEIRO, 2012). The following are the guidelines:

- Provide error prevention (disable what you cannot do, display specific data entry formats when needed)
- Provide easy-to-remember forms of use / interaction, not excluding the need for accessible instructions at all times
- Explore the resources of the technologies employed (hypertext, flash, video, etc.)
- Use a standardized and easy-to-understand sequence of actions.
- Use resolution and format of web-compatible images and videos
- Among others

"Providing interaction" guidelines Allow actions among users (students, teachers, tutors, etc.) from and /or on the object (SILVEIRA E CARNEIRO, 2012). The following are the guidelines:

- Provide options for sharing results with teachers, peers, or the wider community (for example, using a blog to make it available and maintain)
- Provide discussion channels among your users
- Specify interaction activities among students among the activities intended for the use of the object.

The guidelines related to "Provide constant feedback" keep the user always informed of the current state of their interaction with OA (SILVEIRA E CARNEIRO, 2012). The following are the guidelines:

- Provide clear indications of what the user should do to proceed to next steps of object use (next step messages)
- Open files external to the object context in new tabs, warning the user that this will happen before they perform the action.
- Always keep the object name visible
- Allow the user to fully view questions that were hit / miss when using quizzes and / or exercises and allow them to go back and try again and / or restart

- Explain in case of questionnaires and / or exercises resolution how the assessment
- Among others

The guidelines related to "Being self-contained" require that the object must focus on a particular subject and explain it without necessarily relying on other objects and / or materials (SILVEIRA E CARNEIRO, 2012). The following are the guidelines:

- Select the appropriate amount of information that represents the specific content of the object.
- Present content in a way that does not address other subjects and distract student attention
- Not require the search for external information to understand the activities and contents presented in the object.

To adapt to the case study questionnaire developed in this paper, each set of guidelines has been separated into sections using the free Google Forms platform (https://www.google.com/forms/).

The questionnaire was emailed to a list of 11 experts with experience in the VISIR + project. These specialists should be researchers with experience in the VISIR + project. They could be teachers or professionals in the field of educational technologies and could live in any of the countries where the project was applied.

4. Results

4.1 Results: The Labs4STEAM Platform

The Labs 4 STEAM platform was developed using Dokuwiki, an open source wiki software containing a large number of plugins (GOHR, 2017). According to Dokuwiki's official website homepage (2018), the software is admired by its users for its clean and easy-to-read syntax, as well as its easy maintenance, backup and integration. Built-in access control and authentication connectors make Dokuwiki especially useful in the corporate context and the high number of plugins built collaboratively by your community (DOKUWIKI, 2018).

Initially, the platform would only provide access to lesson plans related to the use of the remote VISIR lab. However, in thinking about the platform's expansion and greater popularity among its future users, it was decided that the platform would also accept other remote labs, and in the future even simulations.

The platform was developed during the first half of 2018 and is available for access in September 2019 and is available at: http://labs4steam.rexlab.ufsc.br/

A difference in permissions has been established between registered users and visitors to strengthen the platform's security and to prevent possible interventions by an unselected audience to use it. Only teachers may discuss and submit new practices. The administrator checks each platform registration request.

The platform is available in English, Portuguese and Spanish. However, for purposes of limitation, not all practices are available in all languages. The platform allows the translation of its interface, but not the content posted manually by the user. Therefore, it was proposed to users that the platform is willing to

receive volunteers who can translate the practices into other languages. The following flow chart presents the activities that a teacher can perform when using the platform.

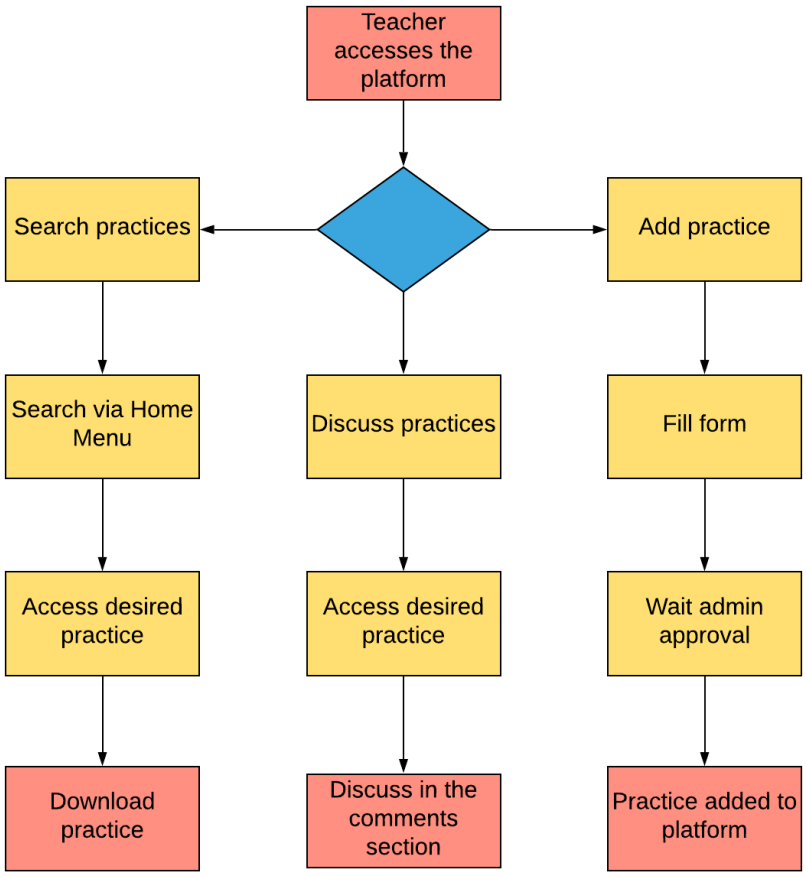


Figure 2. Roles that the teacher can perform on the platform

Following are some screenshots of the platform. Below is the Portuguese home screen, with introductory text, links to the official REXLAB website and its products, and information on how to submit practices for publication on the site, as well as instructions for registering on the platform.

The following figure shows the Labs4STEAM home screen in Portuguese. Alternatives to other languages are still open as translation will be done voluntarily by platform users. The home page displays the following introductory text:

"Labs 4 STEAM: Collaborative Virtual Environment for Sharing Teaching Experiences for STEAM Disciplines

Hello teacher! Welcome to Labs 4 STEAM, the ideal place to share STEAM lesson plans for free. Do you know what STEAM is?

STEAM: Acronym for Science, Technology, Engineering, Arts and Mathematics - or Science, Technology, Engineering, Arts and Mathematics

In this way, the teacher of Mathematics, Arts, Physics, Chemistry, Informatics, Robotics, Sciences, among others can find in Labs 4 STEM a place to discuss lesson plans.

On this platform you can:

Share lesson plans

Download lesson plans from others (to download the desired lesson plan, click on “ODT EXPORT” in the black sidebar)

Dialogue and meet fellow teachers

Start browsing:

Create Registration (You can browse the platform without a registration, but you will need one to participate in discussions)

Search by course

Submit lesson plan

About Labs4STEM "

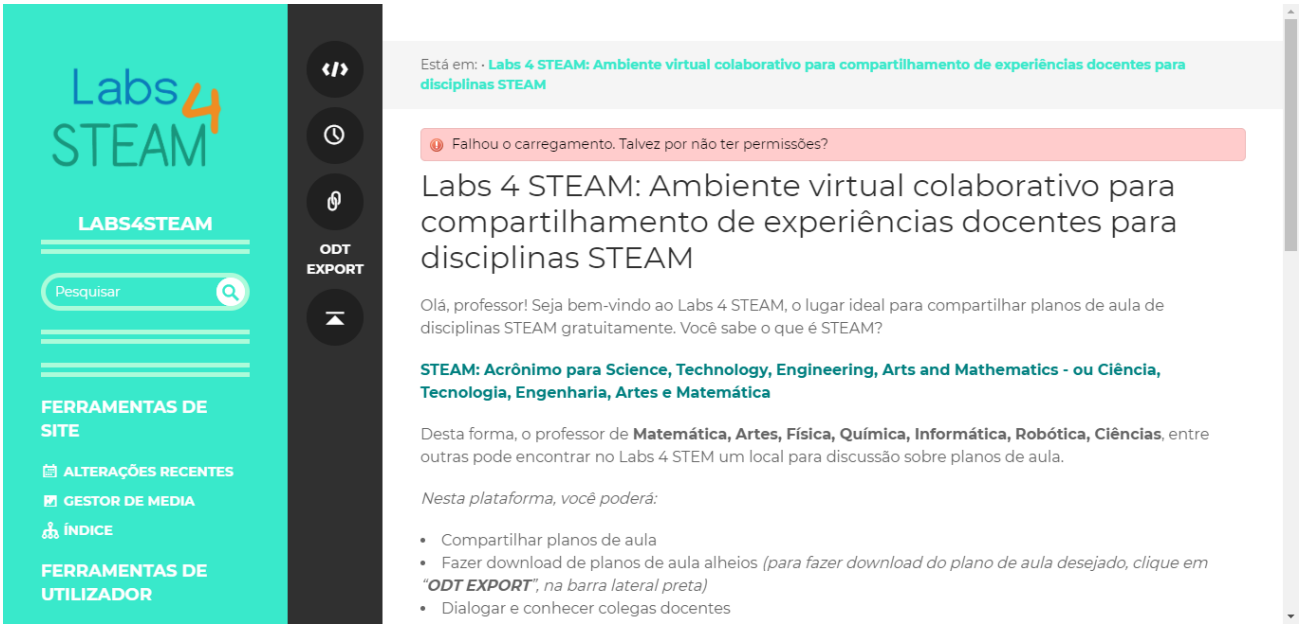


Figure 3. Platform home screen

The following screen presents the Labs4STEAM comment section. This is a space for discussion where teachers can ask questions and compliment and improve opportunities to the lesson plans exposed on the platform. This section is present on all pages of the platform, featuring comments intended for each of these pages.

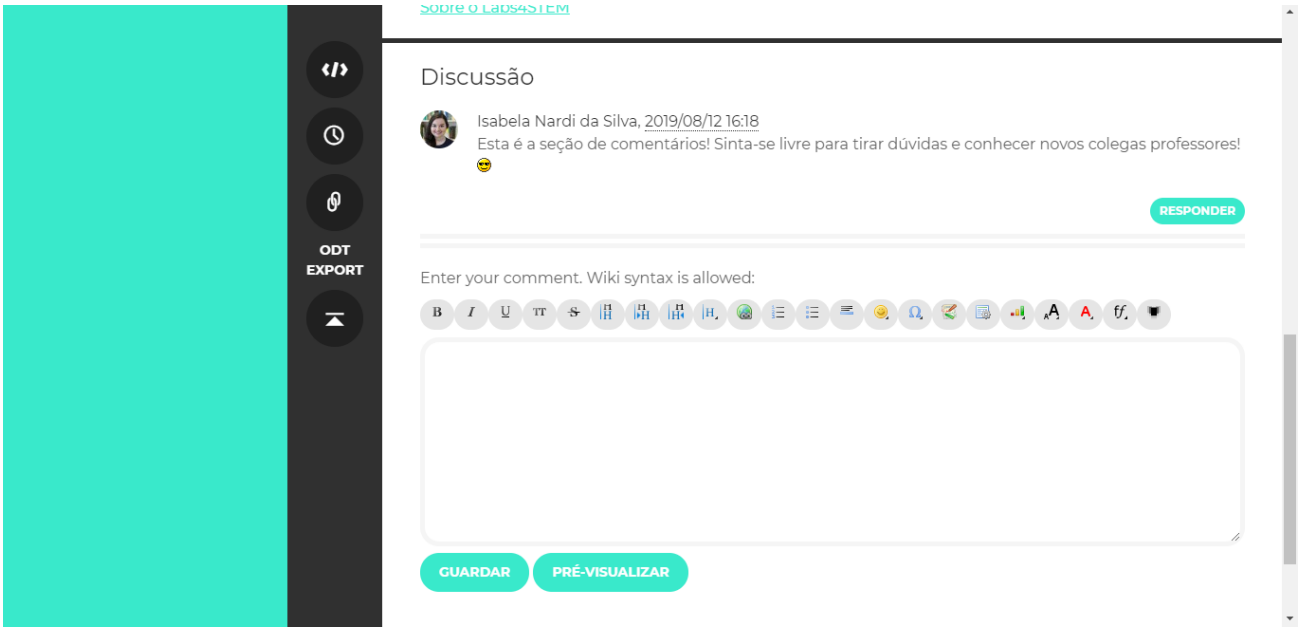
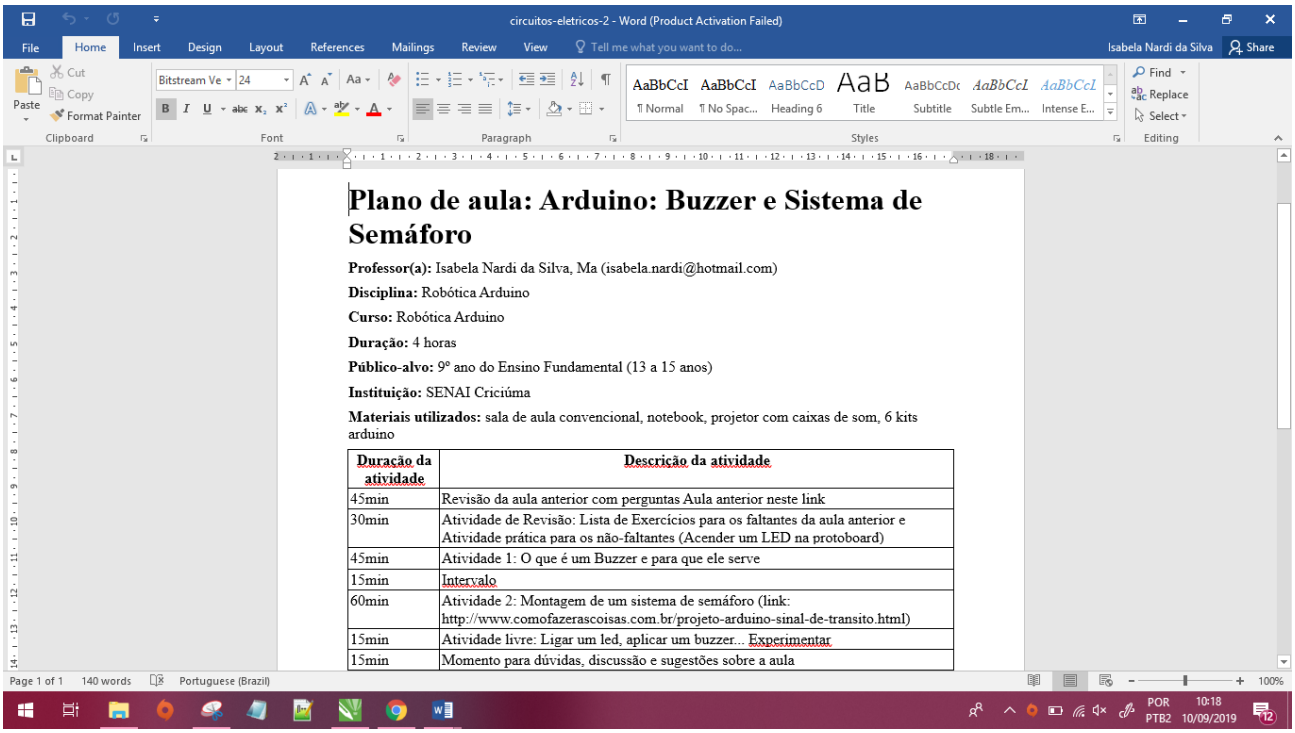


Figure 4. Comment Section

The figure below presents an example of a lesson plan registered in Labs4STEAM. The lesson plan consists of a title, the name of the teacher, the name of the subject, the course within which the subject was taught, the duration of the lesson, the target audience, the educational institution and the materials used. After this information, there is a kind of programming to explain when each class activity took place.

Figure 5. Example of lesson plan registered in the platform

The platform also has a feature for its users to download each lesson plan registered in .ODT file, after clicking the "ODT EXPORT" button. This feature allows, in addition to the printing of the lesson plan, its offline use and the possibility of editing to adapt to the reality of the teacher who wants to replicate it.



Plano de aula: Arduino: Buzzer e Sistema de Semáforo

Professor(a): Isabela Nardi da Silva, Ma (isabela.nardi@hotmail.com)

Disciplina: Robótica Arduino

Curso: Robótica Arduino

Duração: 4 horas

Público-alvo: 9º ano do Ensino Fundamental (13 a 15 anos)

Instituição: SENAI Criciúma

Materiais utilizados: sala de aula convencional, notebook, projetor com caixas de som, 6 kits arduino

Duração da atividade	Descrição da atividade
45min	Revisão da aula anterior com perguntas Aula anterior neste link
30min	Atividade de Revisão: Lista de Exercícios para os faltantes da aula anterior e Atividade prática para os não-faltantes (Acender um LED na protoboard)
45min	Atividade 1: O que é um Buzzer e para que ele serve
15min	Intervalo
60min	Atividade 2: Montagem de um sistema de semáforo (link: http://www.comofazerascoisas.com.br/projeto-arduino-sinal-de-transito.html)
15min	Atividade livre: Ligar um led, aplicar um buzzer... Experimentar
15min	Momento para dúvidas, discussão e sugestões sobre a aula

Figure 6. User downloaded lesson plan example

The platform registration form was developed using the Google Forms tool and consists of the following questions: full name, date of birth, email, training and subjects you teach. After completing the form, the applicant will receive their username and password by email within 24 hours. From the moment they are registered, the user is allowed to comment on the platform. If not registered, the user can still download lesson plans and research them, however, for security reasons it was determined that only registered users could make comments.

Figure 7. Registration Form

The form for submitting lesson plans to Labs4STEAM was also developed using the Google Forms tool. It includes: full name, education, e-mail, lesson plan course, other subjects you teach, and upload lesson plan to .PDF, .DOC or .PPT, and the like. It was defined that the plans would be sent via form, not entered directly by users to the platform, to control the material to be posted on the platform.

Figure 9. Lesson Plan Submission Form

A section called "About Labs4STEAM" has also been inserted with information about Labs4STEAM to explain its origin. The section, presented below, also features some platform outreach videos.

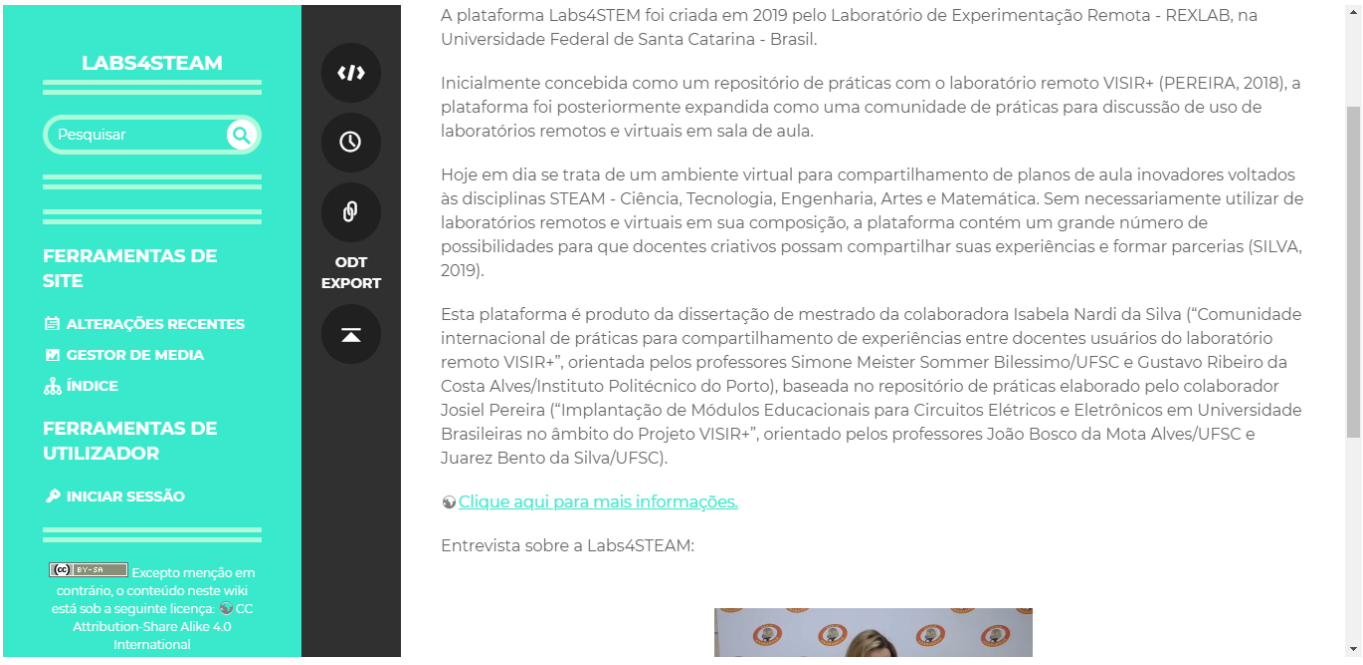


Figure 10. "About Labs4STEAM" Section

4.2 Results: Questionnaire Expert Responses

This subsection will present the answers of the experts to the questionnaire. In order to make the research more succinct, 2-4 questions were selected from each category of the questionnaire for presentation at work.

It can be seen that many experts pointed out the "indifferent" alternative on some issues. This is because the platform is hosted on a server located in REXLAB, at UFSC Araranguá, Mato Alto Unit. The Unit has suffered from many power outages due to a series of storms that occurred during January 2018.

Thus, the platform was unavailable and the only way for experts to view it was through an explanatory video. This video had been made prior to the platform deactivation and would only complement the introduction of the questionnaire, so it was not equipped with the answers to all the questions. However, many of the answers could not be answered just by watching the video, so the experts could not agree or disagree with some of the statements presented.

4.2.1 PEDAGOGICAL PURPOSE OF THE PLATFORM

In their study, Silveira and Carneiro (2012) stipulate some guidelines for the evaluation of learning objects. The first of these guidelines is called the Platform Pedagogical Objective. This guideline should provide clear guidance so that the student knows what he is expected to learn by using the learning object and the teacher (different from who produced the object) knows how to use it (SILVEIRA E CARNEIRO, 2012).

Listed below are some of the questions related to this guideline, as well as presentation of the outcome of these questions:

As can be seen from the graph presented below, the ninth question was related to the user's introduction to the platform, in order to verify if it was properly presented in order to know the purpose of the platform and the content to be treated.

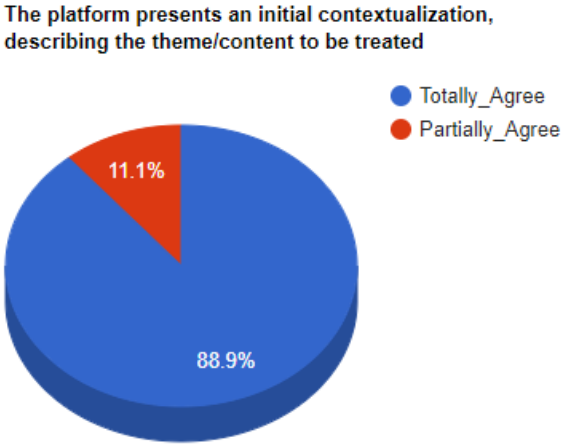


Figure 11. Results for the ninth question: "The platform presents an initial contextualization, describing the theme/content to be treated"

Most experts (88.9%) confirmed that the platform presents an initial contextualization in order to describe the content to be treated; 11.1% partially agreed.

The following chart presents the answers to the tenth question, which asked the expert to select his position in relation to the statement "The platform presents its pedagogical objective".

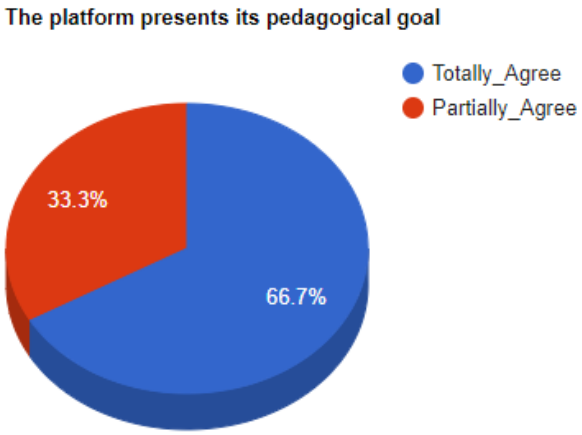


Figure 12. Results for question 10: "The platform presents its pedagogical goal"

As can be seen, most experts (66.7%) fully agreed with the statement, while 33.3% partially agreed.
The following chart presents the results for the fifteenth question, related to the platform's emphasis on the possibilities of use for various user roles.

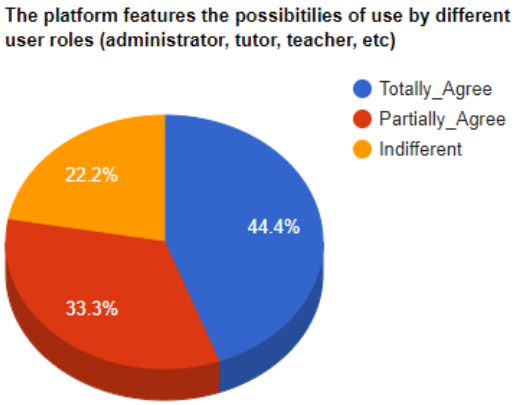


Figure 13. Results for the fifteenth question: "The platform features the possibilities of use by different user roles (administrator, tutor, teacher, etc)"

4.2.2 PRIORIZING DIGITAL

The second guideline, called "Prioritize the digital", should prioritize the development of learning objects that do not need, for their use, application or program that is not available for free on the web (SILVEIRA E CARNEIRO, 2012).

The seventeenth question asked the expert if the platform enabled keyboard navigation, considering accessibility issues, such as visual impairment. The chart below gives the answers to this question:

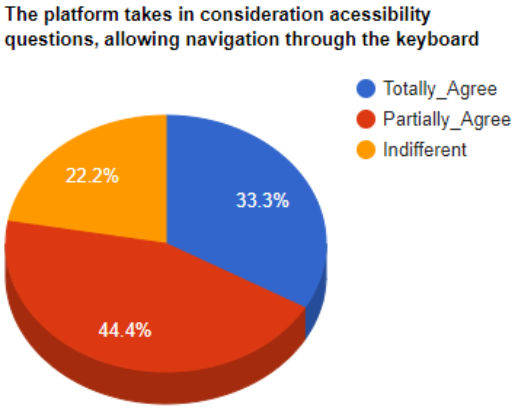


Figure 14. Results for question seventeen: "The platform takes in consideration acessibility questions, allowing navigation through the keyboard"

Most experts agreed with the statement (77.7%), but 22.2% of respondents were indifferent.

The nineteenth question was also related to the accessibility of the platform, so that users with disabilities could access its content. The question presented the statement "The platform avoids the availability of files (only) in PDF format, for presentation of the object and / or material complementary to its use, which are inaccessible via screen readers." The following chart presents the results for this question.

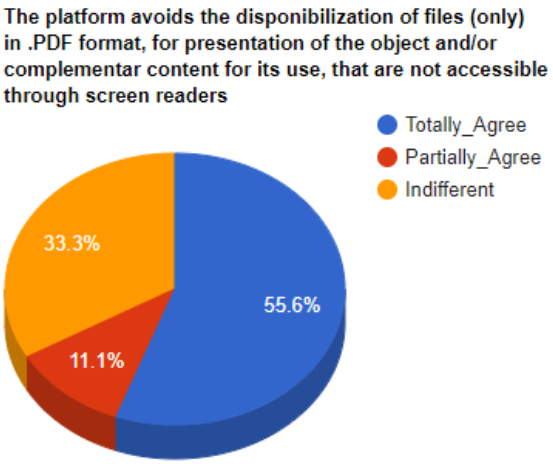


Figure 15. Results for question nineteen: "The platform avoids the disponibilization of files (only) in .PDF format, for presentation of the object and/or complemental content for its use, that are not accessible through screen readers"

It can be observed that most respondents (66.7%) agreed with the statement; However, 33.3% manifested themselves with the alternative "Indifferent".

4.2.3 PROVIDING AID TO USERS

According to Silveira and Carneiro (2012), the third guideline is called "Providing assistance to users", and should offer user assistance via easily accessible interface and instructions.

The twenty-second question was related to the indications regarding the use of the platform by users, presenting the statement "The platform presents clear information for its mode of use, indications provided

in the interface and/or easily provided through the interface". The graph below presents the results for the question:

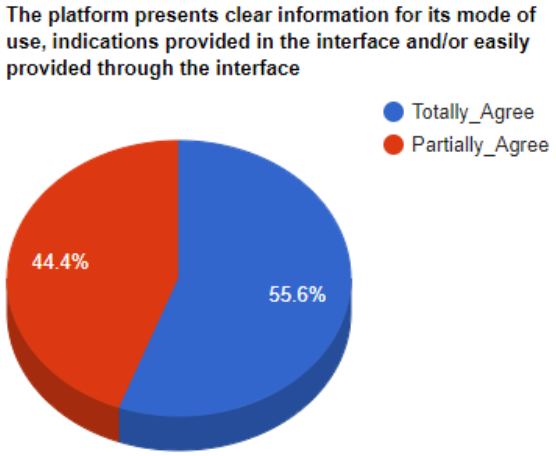


Figure 16. Results for the twenty-second question: "The platform presents clear information for its mode of use, indications provided in the interface and/or easily provided through the interface"

As can be seen, all experts agreed with the statement, but 44.4% agreed only partially.

The twenty-ninth question asked the expert about the standardization of instructions on the platform. The following chart presents the results for this question:

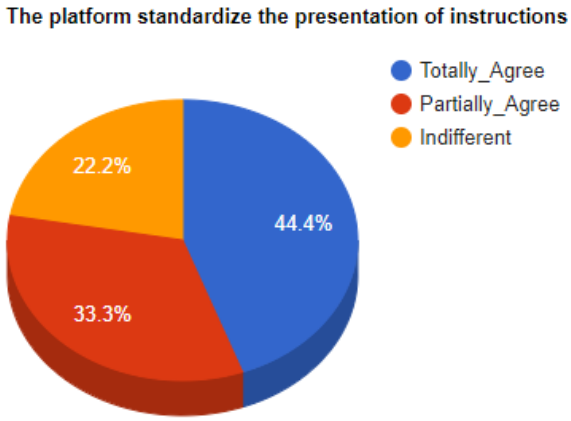


Figure 17. Results for question twenty-ninth question: "The platform standardize the presentation of instructions"

Most experts (77.7%) agreed with the statement (44.4% agreed completely and 33.3% partially), but 22.2% marked the statement "indifferent".

4.2.4 PROVIDING INTERACTIVITY

Silveira and Carneiro define the fourth guideline "Providing interactivity", as "providing the user can interact by performing actions with the object". This guideline is closely related to the aesthetics and layout of the learning object.

The forty-fifth question had the following statement: "The platform maintains a standardization of its layout (use of colors, fonts, etc.)." The following chart presents the results for the question:

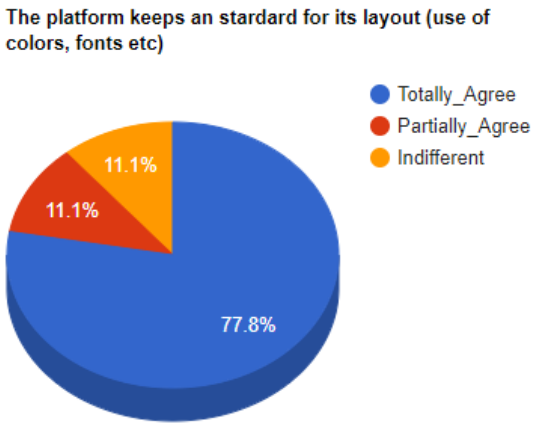


Figure 18. Results for the forty-fifth question: "The platform keeps a standard of its layout (use of colors, fonts, etc.)"

It can be seen from the graph that most experts (77.8%) totally agreed with the statement; however, 11.1% partially agreed and 11.1% were indifferent to it.

4.2.5 PROVIDE INTERACTION

The fifth guideline is called "Providing interaction", and consists of allowing actions between users (students, teachers, tutors, etc.) from and / or on the object (SILVEIRA E CARNEIRO, 2012).

The forty-eighth question asked the experts whether the platform came from sharing results with other members. The results for this question are as follows:

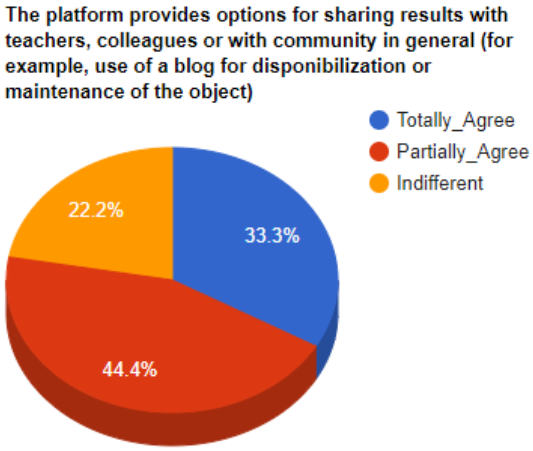


Figure 19. Results for the Forty-eighth Question: "The platform provides options for sharing results with teachers, colleagues or with community in general (for example, use of a blog for disponibilization or maintenance of the object)"

Most experts (77.7%) agreed with the statement (33.3% fully and 44.4% partially), and only 22.2% were indifferent.

The forty-ninth question contained the statement "The platform provides discussion channels among its users." The results for this question are shown in the following chart:

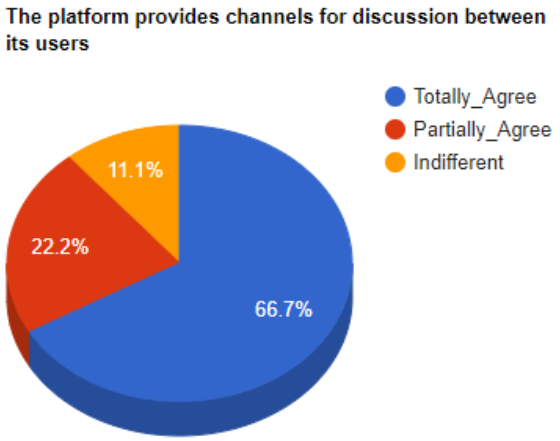


Figure 20. Results for the forty-ninth question: “The platform provides channels for discussion between its users”

Most experts agreed with the statement (66.7% strongly agreed and 22.2% partially agreed) and 11.1% were indifferent.

4.2.6 PROVIDE CONSTANT FEEDBACK

The sixth guideline, “Provide constant feedback”, should keep the user always informed of the current state of their interaction with OA (SILVEIRA E CARNEIRO, 2012).

The fifty-first question presented the statement "The platform provides clear indications of what the user must do to proceed to the next steps of its use (next step messages)." The following chart presents the results for this question:

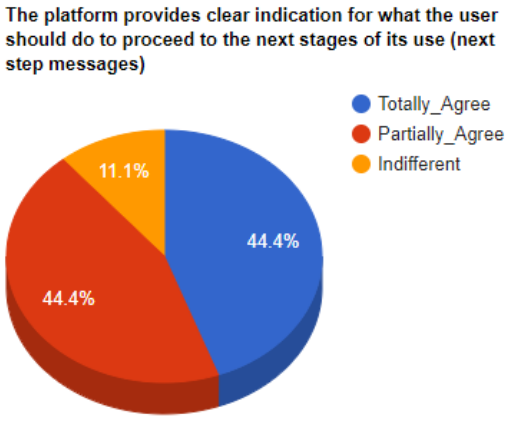


Figure 21. Results for the fifty-first question: “The platform provides clear indication for what the user should do to proceed to the next stages of its use (next step messages)”

Most experts (88.8%) agreed with the statement (44.4% fully and 44.4% partially), but 11.1% were indifferent.

The fifty-third question asked the expert if the platform always kept its name visible. The results for this question are shown in the chart below:

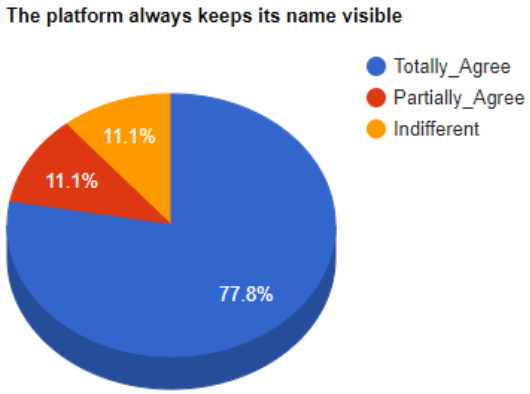


Figure 22. Results for the fifty-third question: "The platform always keep its name visible"

Most experts totally agreed with the statement (77.8%); 11.1% partially agreed and 11.1% were indifferent.

4.2.7 BE SELF-CONTAINED

According to Silveira and Carneiro (2012), the seventh guideline is called "Being self-contained", in which the object must focus on a particular subject and explain it without necessarily depending on other objects and / or materials.

The fifty-eighth question presented the statement "The platform does not require the search for external information to understand the activities and contents presented in the object". The following graph presents the results for the fifty-eighth question:

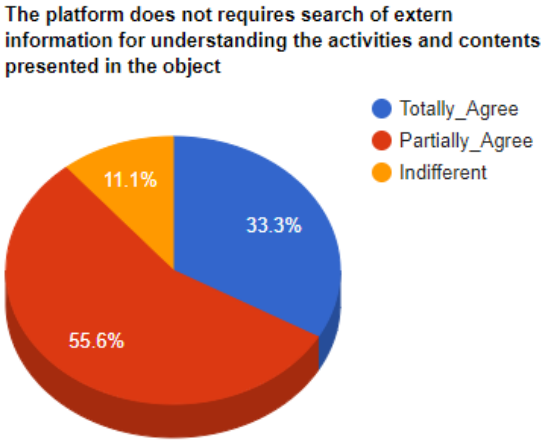


Figure 23. Results for the fifty-eighth question: "The platform does not requires search of extern information for understanding the activities and contents presented in the object"

For the results of this question, 55.6% of the experts partially agreed with the statement, while 33.3% totally agreed and only 11.1% selected the "Indifferent" alternative.

4.2.8 OTHER COMMENTS ON THE PLATFORM

In addition to the previously presented sections, a section called "Other Platform Comments" has been prepared. This section had two questions to be answered optionally. The questions were called

"Platform Strengths" for the expert to comment on platform qualities, and "Improvement Opportunities" for the expert to comment on platform failures and ways to address them.

The following list outlines the platform's strengths, according to experts:

- It is an interesting tool for allowing access to educational resources and sharing resources that can enrich teachers' lessons, such as using virtual and remote labs. The platform provides easy access to materials, and it is interesting to be able to contribute by sending materials to increase the repository of practices;
- offers a very useful feature;
- accessibility and usability;
- simple and appealing visual aspect;
- excellent initiative, congratulations!;
- innovation.

The following list presents the platform improvement opportunities, according to the experts:

- Some usability issues I didn't find so necessary because they are easy to interact with, but for a lay user it can be a hindrance. One usability issue that could be improved was that I couldn't find where to change the language the platform is available on (I couldn't identify where this is done);
- only by using longer could improvements be suggested;
- From what I saw in the demo video it seems to be a very interesting feature and it is clear what its purpose is. however, the associated pedagogical objective is not so clear;
- The demo video is very good for advertising purposes, but it is too short to answer such a comprehensive survey. For this reason, I checked the "indifferent" option when I had no information to refer to certain items.

From the testimony of the experts, it becomes possible to identify what should be done to improve the platform, as well as recognize its qualities.

5. Conclusion

The present research had as proposal to present a collaborative virtual community proposal for teachers using remote laboratories.

From the data collection performed by applying a platform verification questionnaire to a group of experienced experts regarding the VISIR + project, we could receive feedback from the platform. Most of the answers were positive, but there are some details to adjust here, such as better clarity of instructions for the user to understand how to use platform tools such as discussion channels.

This comment presented on the "Improvement Opportunities" discursive question also provides a good critique for future platform enhancements: "Some usability issues I didn't find so necessary because they are easy to interact with, but for a lay user it can be a hindrance [...] ".

Through this research it was possible to realize that the developed platform was welcomed by the specialists, who, during the field visits, even suggested partnerships to elaborate future works. After all, as

presented in the Results chapter, the platform has great potential and only needs a few modifications to be suitable for use by teachers in general.

Next steps will be in terms of dissemination and effective use of the platform.

Thus, from the research developed, future publications can be planned, taking into account the results obtained and experience and partnerships with the VISIR + international cooperation project. Related to the VISIR + project, the platform also functions as a sustainability tool for the project.

6. Acknowledgement

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