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Analyzing the Learners' Experience of an Experimental HCI Course in a Remote Context

Deivid Eive dos Santos Silva [**Federal University of Paraná** | ***dessilva@inf.ufpr.br***]
Guilherme Corredato Guerino [**State University of Maringá** | ***gcguerino@uem.br***]
Natasha Malveira Costa Valentim [**Federal University of Paraná** | ***natasha@inf.ufpr.br***]

Abstract. Learner eXperience (LX) is learners' perceptions, responses, and performances through interaction with educational technologies, involving behaviors, attitudes, sensations, emotional responses, and others. Therefore, this paper reports learners' experiences in Experimental Human-Computer Interaction (Experimental HCI) course in the remote learning format. The activities consisted of synchronous and asynchronous classes. Participants in this exploratory study were undergraduate computer science and graduate computer science learners from a Brazilian university. This study sought to verify the LX elements that may have influenced the learners' knowledge, such as Value, Usability, Desirability, Comfortability, and Adaptability. Thus, learners shared positive and negative feelings regarding their experiences using educational technologies. Finally, 16 LX guidelines for remote learning are presented. It is believed that the knowledge acquired in the course can contribute to preparing these young researchers for research in academy and industry, including undergraduate, master's, and doctoral learners. The results of this exploratory study can direct and support future courses in the remote learning format.

Keywords: *Learner Experience, Experimental HCI, Remote Learning, LX Analysis, LX Elements*

1 Introduction

During the pandemic, research related to the remote learning experience began to be frequently conducted. The knowledge developed through this research is necessary due to the likelihood of future pandemics, incidents, and other situations that could disrupt academic activities. Remote learning has brought several challenges to teachers who have had to adapt and engage learners in online learning environments (Whittle et al., 2020). Remote learning uses e-learning resources, so it facilitates the sharing of knowledge and skills and makes education available to multiple people either at the same time or at different times (Butola, 2021).

In this context, educational technologies have enabled learners to access diverse content through videos, websites, PDFs, and others. However, small learner participation was noticed in the studies on remote learning (Mohmmed et al., 2020; Hammad et al., 2021). Furthermore, the experiences in remote learning exposed the difficulties related to participation in learning. Therefore, combining video calls and asynchronous activities may lead to an isolated learner experience, labeled as "zoom fatigue" (Hammad et al., 2021).

As educational technologies are crucial in the remote learning format, the need to check the Learner eXperience (LX) in remote learning was realized. LX is considered a more general experience (Huang et al., 2019), being an extension of User Experience (UX) to the education context (Kawano et al., 2019). The literature defines UX as "user perceptions and responses that result from the use or anticipated use of a system, product, or service" (ISO 9241-210, 2019). LX can be defined as "learners' perceptions, responses, and performances through interaction with a learning environment, educational products, and resources" (Huang et al., 2019). LX gains prominence due to devices, products, software, systems, and services being increasingly included in learning (Huang et al., 2019), especially in the pandemic period of COVID-19.

During remote learning, Perin et al. (2021), identified that a large part of the resources used to support remote learning were materials in PDF (handouts, lists of exercises and slides). However, these materials are not very dynamic and can have little learning significance. In Queiros et al. (2019), it was identified that this type of material is used improvised, or being copied and pasted from the planning used in the previous year to meet a school standard. Thus, LX becomes even more relevant to be evaluated to create new learning experiences, as society is increasingly heterogeneous and complex (Queiros et al., 2019). For Queiros et al. (2019), educational technologies need to be adopted, but they cannot ignore learners' contexts or fail to take into account their real needs. Learning with the use of appropriate educational technologies can present a high level of complexity, however, with planning, it is possible to insert various educational technologies to support remote learning and LX.

Therefore, Huang et al. (2019) presented five elements of LX: Value, Usability, Desirability, Adaptability, and Comfortability. The authors proposed some questions to investigate the LX and analyze their experiences with educational technologies. The questions presented by the authors are: (Q1) Do learners value educational technology? (Q2) Do learners find educational technology easy to use? (Q3) Do learners enjoy engaging with educational technology? (Q4) Do Learners find the educational technology personally adaptive? (Q5) Do learners feel comfortable with educational technology? Thus, the study presented in this paper aims to answer these questions in the context of remote learning. Thus, the LX elements and questions proposed by Huang et al. (2019) were used to guide the qualitative analysis of this study, not being used for course planning.

Huang et al. (2019) is one of the few works identified in the literature that explore the concept of LX and present well-defined elements to evaluate the learning experience with ed-

ucational technologies. However, the authors did not present the test results with this approach. Through a manual search, we identified research carried out by Hardani et al. (2022), researchers from Indonesia, who used the five LX elements of Huang et al. (2019). Nevertheless, they chose to define their statements instead of the pre-established open questions in the original approach, which can restrict the LX results, which are more subjective. In turn, in our exploratory study, we sought to analyze the responses of Experimental HCI learners through the five questions of LX elements qualitatively. In dos Santos et al. (2022), it was realized that these elements are not commonly used together but in isolation, mainly value, usability, and adaptability. Finally, we analyze how they together contributed in practice, and we defined sixteen LX guidelines for remote learning, which is one of the main contributions of this exploratory study.

From the study published in Silva et al. (2022), more detail of the experiment conducted in the Experimental Human-Computer Interaction (Experimental HCI) course with 36 undergraduate and graduate learners is presented. This course followed document Nº 65/2020-CEPE approved in June 2020 by the Teaching, Research and Extension Council (CEPE) of the Federal University of Paraná UFPR (2020). This document regulated the academic activities in the remote learning modality, called "special period". Also, this document sought to advance the curriculum that had been paralyzed since March 2020 due to the COVID-19 pandemic.

Through an exploratory study of LX in the Experimental HCI course, we identified that the learners could understand different contents related to the course using educational technologies. However, the learners also pointed out some problems related to the teaching and learning of the contents, mainly regarding the length of the remote course. The learners reported the attitudes of the teacher and assistants in providing quick and understandable help and feedback through educational technologies. The learners also shared positive and negative feelings about their experience and learning using educational technologies. The findings allow for designing new LX proposals in the context of remote learning and supporting teachers to improve aspects of LX using educational technologies. In general, we perceived that the course contributed to the preparation of young researchers, such as undergraduates, masters, and doctoral students, through the classes and practical tasks, allowing learners to contact and include their mentors in the learning process.

This paper is organized into Sections. Section 2 will present the Background on learning challenges in remote learning and the LX project in the remote context. In Section 3, the related work will be presented. In Section 4, the teaching methodology proposed in the Experimental HCI course will be addressed. Section 5 will show the qualitative results. In Section 6, the analysis from the perspective of the LX elements, based on the learners' feedback, will be presented. Section 7 presents the LX guidelines for remote learning. Section 8 discusses the results concerning the learning objectives defined in the course. In Section 9, limitations and threats to validity will be presented. In Section 10, final considerations will be made and future steps indicated.

2 Theoretical Background

The literature showed that most teachers adopted asynchronous and synchronous activities to support remote learning. In addition, we identified that non-computing teachers have started to receive massive training in using digital technologies to continue the academic calendar. However, even after the pandemic years, there are still specific difficulties in applying the approaches in practice. The difficulties may be because of the short period to design a fully online course, teachers' adaptation to the use of technologies, learners' lack of focus and interest, and difficulties in accessing virtual rooms (Mohmmed et al., 2020). Thus, it is pertinent to continue investigating ways to evaluate experiences in remote learning, as it is still a recent problem.

The use of educational technologies in remote learning can be evaluated through the LX. The LX concept considers the classroom an integrated system composed of different aspects, such as furniture, equipment, services, software, and others, that can influence the teaching and learning processes (Huang et al., 2019). Therefore, it is necessary to work on five elements to verify LX: Value, Usability, Desirability, Comfortability, and Adaptability (Figure 1). The Value is the central element and aims to confirm if the educational technology meets the needs of the learners and contributes to learning. Usability seeks to verify if educational technology, services, devices, and others are easy to use. Adaptability aims to verify the flexibility of educational technology to see if it adapts to the different needs of learners. Desirability seeks to confirm whether educational technology is fun and engaging for learners. Finally, Comfortability aims to verify whether learners feel comfortable with the proposed educational technology.

Figure 1. LX elements and questions proposed by Huang et al. (2019)

In Value, the following question must be answered: Do learners value the technology? Value is associated with the positive or negative responses arising from the changes and adaptations made in the classroom. The educational technology resources and the classroom layout must be aligned with

the needs of the learners. These needs represent more than explicit needs (things that learners know they want) but include implicit needs (things that learners cannot express as needs, which may be hidden in the learning activities and be recognized by their teacher). To meet implicit needs, educational technology needs to be easy to use to contribute to learners' knowledge (Roll et al., 2015; Huang et al., 2019).

In Usability, the following question must be answered: Do the learners find the technology easy to use? Usability is associated with ease of use and ease of learning. Usability is composed of: a) Learnability: How easy is it for learners to perform basic tasks to use educational technology?; b) Efficiency: After teachers and learners have comprehended educational technology, how quickly do they perform the tasks?; c) Memorability: How easily can they show proficiency when learners return to the project after a period without using it?; d) Errors: How many mistakes do learners make? How serious were these errors, and how easily do they recover from mistakes?; and f) Satisfaction: Does the educational technology meet the learners' needs? Thus, Usability impacts the learner's experience as they learn, do individual and group work, and communicate with teachers and peers (Nielsen, 1994; Vosylius and Lapin, 2015).

In Desirability, the following question must be answered: Do learners enjoy engaging with the technology? Desirability refers to the attractiveness and engagement with educational technology or pleasant perception of teachers and learners about using technologies in the classroom (Huang et al., 2019). In this sense, engagement can be perceived as follows: a) Behavioral: participation in activities such as the number of times learners interact with educational technologies); b) Cognitive-Motivational: motives that influence thinking such as memory, information processing, reasoning, judgment, and decision-making; and c) Emotions: interest, curiosity, sense of belonging, and affection (Fredricks et al., 2004). Moreover, engagement may depend on the methods adopted for content presentation, technological resources, and others (Corbin, 2019; Huang et al., 2019).

In Adaptability, the following question must be answered: Do learners find the technology personally adaptive? Adaptability refers to the learners' diversity and learning preferences, which implies the need to treat them as individually as possible. The classroom layout should be flexible to meet the teacher's instructions and allow collaboration among learners (Huang et al., 2019). The educational technology should be adapted to the learning styles of the learners, such as auditory (learners retain information more easily when they listen and talk about it), kinesthetic (learn more easily through hands-on activities, such as those that require movement and physical effort), and visual (learners remember content better when they write it down and enjoy lessons where information is presented visually). Also, this element of LX enables learners to complete activities more quickly while providing opportunities to learn and perform better (Agarwal et al., 2006).

In Comfortability, the following question must be answered: Do learners feel comfortable with educational technology? This element refers to physical and emotional well-being when learners use educational technology. Therefore, several factors must be considered, such as temperature, humidity, noise, air quality, acoustics, dust, lighting, and others. These factors are considered necessary because, for example, adequate lighting can enable healthy reading, air quality can encourage learners' concentration, classroom acoustics can contribute to good communication, and classroom decor can instigate learners in understanding (Huang et al., 2019).

No study has been identified in the literature that addresses LX and its elements holistically in the remote learning context. Moreover, learners' difficulties in remote learning are significantly varied. Thus, it is necessary to look at remote learning practices holistically to include various aspects of the learners' experience in using educational technologies. Therefore, it is believed that the elements: Value, Usability, Desirability, Adaptability, and Comfortability can help design new learner experiences in remote learning.

3 Related Works

This Section will present some studies identified from a Systematic Mapping Study (SMS) that aimed to characterize initiatives that evaluate LX, and that use technological resources in the learning process (dos Santos et al., 2022). For this experience report, the cited SMS studies were selected based on two criteria: (1) they were conducted in the context of online learning, and (2) they were conducted in Higher Education. These criteria were adopted because the experience reported in this paper relates to a subject given in Higher Education and the remote context. Thus, the selected studies evaluated LX in the university from resources used in remote learning, such as Massive Open Online Courses (MOOCs), Learning Management Systems (LMSs), video calling platforms, and streaming video content platforms. In all studies, the elements of LX were recognized implicitly, with Valor being the most worked-on element.

In Magyar and Haley (2020), a case study was conducted with undergraduate Computing learners to balance LX and UX when designing and developing a peer feedback web application for MOOCs called Gallery Tool. The app is learner-centric, providing a space for shared work, allowing access to peer feedback, and providing courses and assignments. Eighteen learners tested the tool on three MOOCs and participated in an interview via Google Hangouts. Magyar and Haley (2020) evaluated the Value and Usability elements. Thus, the interview sought to investigate their motivation for using the app, what they liked most and least about it, what they thought about it being feedback-focused, and what impact it had on the learning experience. The design and planning stages of the project resulted in a more flexible and learner-centered app. Learners praised the Usability of the app; however, they were demotivated to use it after noticing few activities available.

In Stanley and Zhang (2018), an experimental study was conducted with undergraduate Business Administration learners. This study sought to increase learner knowledge and retention in online education. As part of the study, each learner was asked to produce a video showing how to solve a typical multiple-choice problem on an exam. The learners chose the topic and created the video. Finally, the learners posted the video link in the Moodle discussion forum. Other learners viewed it and provided ratings and comments on the

forum. Stanley and Zhang (2018) evaluated the Value and Desirability elements. Therefore, at the end of the course, a first survey was carried out, in which learners were asked about the perceived challenge in the course activities, course interactivity, and active learning behaviors, as well as their perceptions of course presence and social engagement. The second survey also included questions about learner outcomes, including scalar and open-ended questions about how the course affected learners' performance, learning, satisfaction, and success. Results showed that most learners felt they had strong skills and self-direction for online courses. However, few strongly believed in the effectiveness of the course. For some learners, activities made it possible to improve engagement and learning. For others, the activity was challenging, especially for those without technical skills or English as a primary language. Finally, the authors believe that if the learners had done more activities, such as three different videos, they might have had more significant learning gains.

In sequence, Donelan and Kear (2018) present a study on undergraduate learners' experiences of collaborating online to create a website. Learners were placed in groups of five to eight participants. Tutors supported the learners and also marked their tasks when completed. Learners had one-on-one contact with the tutor, either by email, discussion forums, or phone; received feedback on their first assignment; and had the opportunity to attend a tutorial either face-to-face or online. The groups had access to several online tools, such as WordPress, to perform web development, a forum to facilitate group discussion, and a wiki to document decisions made by the group. In addition, some groups could use other tools they were more familiar with. The authors evaluated the Value and Desirability element in this study from the collaborative learning perspective. Thus, the learners participated in online focus groups after completing their assignments. In the qualitative analysis, it was identified that 17 learners commented on positive feelings, and five learners commented on negative feelings. Comments related to Pleasure and Reward were fairly equivalent among comments that referred to the collaboration process and the website development task. In addition, the comments related to Challenge were about collaboration, while most of the comments about Frustration were about the task.

Finally, Reyna and Meier (2018) present a pilot study with undergraduate Science learners. The study aimed to test a model for designing, implementing, and evaluating Learner-Generated Digital Media (LGDM). In this sense, the learners carried out digital media projects with resources incorporated into the LMS to support them in their tasks. Learners had access to a page in the LMS that contained the following sections: (1) a "welcome to LGDM assignments" video, (2) an interactive lecture on digital presentations/brochure design, (3) frequently asked questions about digital media assignments, (4) examples of LGDM developed in previous years, (5) the evaluation rubric, and (6) instructions on how to upload digital presentations to YouTube channels. The authors assessed the Value and Desirability elements. Accordingly, at the end of the semester, learners were asked to complete an online questionnaire with 33 items about their classroom experiences. The questionnaire was organized into six categories, being exemplified in this paper one item per category: a) Demographics (gender, age, education), b) Digital media support (I found the digital presentation lecture engaging), c) Attitude towards technology (I enjoy using technology for learning), d) Understanding of the assignment (I was happy about the digital media presentation assignment), e) Knowledge construction (I believe using digital presentations helped me to understand the topic), and f) Open-ended Questions (What did you like most about the assignment?). As the main features of the assessment, the learners highlighted creativity, teamwork, digital media support, learning the subject's content, and self-expression.

The studies presented used different features of remote learning, being able to provide courses, assignments, materials, and feedback. In summary, Magyar and Haley (2020) identified that too few activities in Moodle demotivate learners. Moreover, Stanley and Zhang (2018) believed they could have more significant learning gains if they had conducted more activities with the learners. Donelan and Kear (2018) highlighted that collaboration is one of the main challenges in online learning. Thus, it can be frustrating to complete some tasks, and monitoring done by the teacher is indispensable. As mentioned earlier, in all studies, LX was evaluated through the Value element to identify whether the educational technology contributed to learning. In turn, Magyar and Haley (2020) also focused on Usability, while the other authors dealt with Desirability, mainly on the issue of engagement and feelings of learners (Donelan and Kear, 2018; Stanley and Zhang, 2018; Reyna and Meier, 2018). In addition to these elements addressed in these related works, other elements were analyzed in the exploratory study reported in this paper, as will be seen in Section 6.

4 Methodology

In this exploratory study, a self-assessment questionnaire was applied to learners of the Experimental HCI course taught in the remote learning context because of the COVID-19 pandemic. The methodological details followed in this study are shown in the next subsections.

4.1 Context

The Experimental HCI course in remote learning had a workload of 60 hours, divided between synchronous and asynchronous activities. The synchronous activities and classes were delivered through the BigBlueButton (BBB) platform. During the synchronous classes, there were discussions, exposition of the contents, demonstration of the practical application of the theory, and guidelines for the weekly activities that consisted of readings and practical tasks. For the asynchronous activities, the learners received the class recordings, the specifications of the practical tasks, papers, book chapters, and suggestions for further reading. The asynchronous activities were made available on the course's Moodle. The topics taught in this course were: (i) introduction to Experimental HCI; (ii) planning, execution, and analysis of Systematic Mapping Study and Systematic Literature Reviews (SMS/SLR); (iii) planning and execution of experimental studies; (iv) quantitative analysis of experimental studies; (v)

qualitative analysis of experimental studies. Learners were assessed through six practical tasks involving the topics:

- Practical Task 1: planning the protocol of the SMS. In this task, the learners should define: (a) the context and the need for an SMS; (b) the objective and search questions; (c) the languages used in the search; (d) the search string, the search engines and the procedure used in each of them. Finally, the learners performed the pilot test to refine the string;
- Practical Task 2: partial execution of the planned SMS. In this task, the learners should: (a) define the criteria for inclusion and exclusion of papers; (b) define the first and second filter for the selection of publications; (c) create the extraction form with the possible answers to the questions defined in Practical Task 1; (d) identify the first 50 publications returned of the search; (e) conduct the first filter on these 50 publications; (f) conduct the second filter for the publications that were approved in the first filter; (g) extract the data from the first five papers approved in the second filter;
- Practical Task 3: planning a controlled experiment. In this task, the learners should: (a) define the purpose of the experiment using the Goal-Question-Metric (GQM) paradigm (Basili and Rombach, 1988); (b) formulate null and alternative hypotheses; (c) select dependent and independent variables and define how the dependent ones would be collected and calculated; (d) specify the design of the experiment; (e) select the participants and the environment of the experiment; (f) define the instruments of the study, including the Informed Consent Form, the characterization questionnaire and the self-assessment questionnaire; and (g) present the threats to the validity of the experiment;
- Practical Task 4: execution of the pilot study of the experiment. In this work, the learners should invite at least two people to participate in the experiment planned in Practical Task 3. In the end, the learners should submit a report about the pilot, containing: (a) the characteristics and previous experiences of the participants; (b) the preparation of the pilot study, as well as the training and instructions given to the participants; and (c) the procedure of the pilot study, showing the steps that the participants performed;
- Practical Task 5: reproducing a quantitative analysis of an experiment. The learners should: (a) identify a scientific paper that has enough quantitative data to reproduce the statistical tests; (b) study the statistical tests used by the authors of the paper; (c) reproduce the tests using a statistical analysis tool; and (d) create a report showing the steps followed and the results of the tests;
- Practical Task 6: reproducing a qualitative analysis. In this work, the learners should: (a) choose a set of qualitative data for analysis, which could be obtained from scientific papers related to the learner's theme, the results of the pilot test of Practical Task 4, a new questionnaire or interview execution for the collection of this data; (b) through a qualitative analysis tool, the learners should analyze and code the data; and (c) create categories to group the codes identified in the previous item.

4.2 Participants

The participants in this study were the 36 learners who took the course in remote learning. Of these learners, six were in their final year of undergraduate study in Computer Science and three in Biomedical Informatics, 15 were Master's degree learners in Computer Science, and 12 were Ph.D. learners in Computer Science.

4.3 Data Collection Instruments

At the end of the course, the learners completed a self-assessment questionnaire. The teacher was careful to inform the learners that they were not being evaluated in the course. Therefore, they were not obliged to participate, only if they felt comfortable. In addition, the learners were given a week to answer the questionnaire asynchronously through Google Forms, avoiding embarrassment. Finally, participants' data were anonymized to ensure confidentiality following ethical recommendations. The questionnaire is available at the following link `https://doi.org/10.6084/m9.figshare.19790464.v1`. The questionnaire contained four fields for learners to comment on their experiences:

- 1. *Learning*: this field was used to extract information on how the learner classifies his learning during the course in the context of remote learning. Through this self-assessment, learners could share if they were happy with their learning during the course or if they believe that it could have been better.
- 2. *Lessons given*: this field extracted the learners' opinions about the lessons given remotely. Thus, if they wished, they could also report on the teacher's performance and the presence and support of the assistants during the course.
- 3. *Performance*: this field aimed to extract information on how the learners evaluated their performance when doing the practical task using the educational resources, which are part of the context of the course.
- 4. *Feeling after completing the course*: this field extracted positive and negative perceptions of learners upon completing the course in remote learning.

4.4 Analysis

The method used for qualitative analysis was Content Analysis (Drisko and Maschi, 2016), containing the steps: (a) pre-analysis, (b) exploration of the material, and (c) treatment of the results (Figure 2). The pre-analysis step refers to the organization of the data, being the first contact with the analyzed data. The material exploration stage is the data analysis, where the data are coded, and then the categorization is done, where the codes are grouped. Finally, in the results' treatment stage, the synthesis, selection, inference, and interpretation of the results occur. In this study, coding of the learners' comments was carried out with a focus on their experiences. Then, the codes from the previous step were grouped, and categories were created. This process was carried out by a researcher and reviewed by a second researcher,

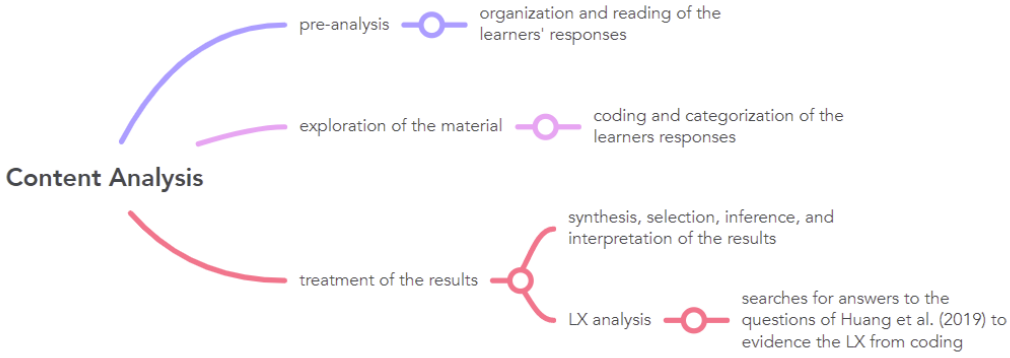

Figure 2. content analysis steps and activities

where a consensus was established when there was disagreement. The tool used for the analysis was Atlas.ti version 7. Finally, the content analysis provided results to analyze the LX. In this way, the open questions proposed by Huang et al. (2019) helped to identify in the coding the elements that characterize LX.

5 Results

From the qualitative analysis of the answers obtained, the categories identified were: Concepts learned by the learners; Relevance of the course content; Problems related to the course content; Learners' performance; Positive attitudes of the teacher and/or assistants; Learners' positive feelings; Learners' negative feelings; Relation of the course to academic activities; and Relation of the course with industrial activities. The results for each of the categories are detailed in the following subsections. Moreover, all these results can be accessed through a technical report[1].

5.1 Concepts learned by the learners

The results of this category report that the learners comprehended several concepts taught during the Experimental HCI course. One learner mentioned learning in detail about planning systematic reviews (see the quote from L06). In addition, learners mentioned understanding quantitative and qualitative analyses (see quotes from L32, L10, and L36). Also, learners reported comprehending tools that assisted them in their activities (see quotes from L35 and L27).

"I have already had experience designing and conducting systematic reviews, but the course has allowed me to identify details in the planning that will certainly help me in future reviews." (L06)

"In the quantitative and qualitative analysis part, I could not follow the extra materials like in the previous classes. However, following the classes on these last topics, I could understand them well." (L32)

"The analyses were of great importance because they can be applied both in literature mapping (my current research activity) and in experiments to be conducted in the future." (L10)

"The lessons and activities concerning the primary study and experiments also added to and contributed to my research." (L36)

"I think the last two tasks were excellent because they allowed me to learn software that I had never used before." (L35)

"I realized how important it is to plan a qualitative data extraction tool and how to use the Atlas.ti tool to analyze this data." (L27)

[1] `https://figshare.com/s/d7a9df1337aa94d39a09`

5.2 Relevance of the course content

In addition to reporting which contents they could understand during the course, the learners also mentioned the contents' relevance. Some learners believe that the contents learned will be relevant in the future when they need to put into practice the concepts learned in their research (see quotes from L04, L05, and L06). In addition, other learners reported that the course has broadened their range of knowledge, helps guide new research, and will help them in their doctoral research (see quotes from L36 and L33). Still, one learner commented that it is important that every postgraduate learner knows the course's concepts and that, although it is a course with an HCI theme, the concepts go beyond this area (see quotes from L23). Finally, the learners were able to visualize differences in research concepts in the industrial and academic environment, as well as understand what academia and industry expect from them as professionals (see quotes from L01 and L10).

"Some things were not my focus at the moment, like collecting data from people, but of course, I kept the course and put effort into the work as I may use it in the future." (L04)

"Overall, I learned a lot, and it will be very useful in the future. This course is a "scientific methodology" of the master's degree. There is a lot that will be useful." (L05)

"Through this course, I had the opportunity to realize several concepts and techniques that will be very important for my education, both for the thesis and for future experiments that I will carry out." (L06)

"In short, and without any cliché, the learning obtained in the course opened the range of my knowledge; all the content passed and suggested helped me and will help me in my steps toward the doctorate, research, and professional life." (L36)

"I believe that the content presented can serve as inspiration for new searches and research." (L33)

"I think that even though it is an HCI course, the concepts go beyond this. Another point is that every learner at this stage of graduate school should have these concepts covered, even if at a theoretical level for research reading." (L23)

"I loved the course and seeing the differences in research approaches in the market and academia." (L01)

"The course showed me what the academy (or even the industry) expects from me as a professional, and how I should always seek to learn more and improve my skills and knowledge." (L10)

5.3 Problems related to the course content

Even though the learners recognized the contents' relevance, some problems related to these contents were identified. For example, one learner was migrating from Graphic Design to Computer Science and had difficulties assimilating the

concepts (see the quote from L20). Other learners found the course laborious (see quotes from L05 and L24). In sequence, one learner commented that the recommended readings helped a lot, but he could not go deeper into the course (see quotes from L07). Finally, another learner mentioned that the contents require more time to be learned (see the quote from L23).

"I had some problems due to my inexperience with Computing since my undergraduate degree was in Graphic Design. Several contents, such as the elaboration and application of experiments, are things that I had already performed several times in Design, but I had to adapt to the immensely different perspective of methodology that Computing presents." (L20)

"In the first week, some friends helped me, but even then, I thought it [had a lot of content]. (L05)

"It is the first remote learning course I have completed. I found it to be an interesting but laborious experience." (L24)

"The recommended readings were very helpful in understanding the various themes. It was possible to go through the themes, but not deeply." (L07)

"I think the period was too tight for the proposed activities. These are contents that take time to learn." (L23)

5.4 Learners' performance

Despite the problems identified, we found that the learners enjoyed their performances during the course. Some learners reported that, even with a time limitation to perform the activities, they believed they had a good performance and understanding (see quotes from L23, L09A, and L09B). In addition, other learners were satisfied with their performance for delivering the activities on time (see quotes from L08 and L28). Finally, other learners stated that they could get their questions answered, which may have contributed to a good performance (see quotes from L08, L06, and L04).

"Despite the time available, I believe I performed the activities in the correct density to practice the course matter for understanding." (L23)

"Within my time constraints, I tried to make the most of them by rewatching the recorded classes and reading the available material." (L09A)

"Considering the time constraints to deepen and "test" the new knowledge, I believe I performed well because I exceeded my expectations." (L09B)

"I fulfilled the requirements of the activities and tried to go above and beyond with my group mates." (L08)

"I turned in all the activities and only missed one class due to a lack of internet." (L28)

"I believe my performance resulted from hard work and dedication, so I rate it "very good"." (L08)

"I was able to perform very well throughout the course because all the doubts I had I was able to solve by different means." (L06)

"For my goal in taking the course, I was delighted with my result." (L04)

5.5 Positive attitudes of the teacher and/or assistants

According to the reports of the learners, a fact that contributed to their good performance was the attitudes that the teacher and the assistants took during the course. For example, one student positively emphasized the teacher and the assistants' conduct in answering questions quickly (see quotes from L18 and L10). Furthermore, the learners reported other positive characteristics of the teacher, such as patience, availability, and good communication (see quotes from L19, L29, and L06). In addition, the learners perceived that the teacher possessed a mastery of the contents taught, which passed confidence and inspiration (see quotes from L10).

"I thank the teacher and the assistant for their availability and for always answering my questions quickly." (L18)

"I also congratulate the assistant, who was willing to be an assistant in the course and was always ready to answer questions clearly and concisely." (L10)

"The teacher is very patient and friendly." (L19)

"The teacher was very approachable and always showed interest in helping." (L29)

"The language used by the teacher was also important, as understandable terms were used." (L06)

"The teacher has a wealth of knowledge and mastery in all the subjects presented and discussed, which gives me confidence about the quality of the course I took." (L10)

5.6 Learners' positive feelings

The learners' good performance, influenced by the attitudes of the teacher and the assistants, generated positive feelings in the learners at the end of the course. For example, the learners felt inspired and happy at the end of the course because they learned a lot of the course's content (see quotes from L10, L13, and L15). In addition, learners reported feeling more confident and prepared to conduct research after taking the course (see quotes from L34, L13, and L12). Also, the learners feel grateful and with a sense of accomplishment for completing the course, even in a challenging context like remote teaching (see quotes from L06 and L27). Finally, one learner mentioned that he feels grateful because the course helped him to abandon the idea that the school year would be lost because of the pandemic (see the quote from L22).

"I am inspired because the issues covered have further opened my mind to conducting more rigorous, systematic, and organized research." (L10)

"I am glad that I learned more about how to develop a survey better." (L13)

"I am happy to have completed the course and learned concepts that will help me write the dissertation." (L15)

"At the end of the course, as we learned many new things, I feel confident that I can develop better and higher quality work from now on." (L34)

"I feel ready to do future research with the things I have learned in this course." (L13)

'I feel confident because I have a basic and practical knowledge of conducting an experimental study and a literature review." (L12)

"At the end of the course, I feel that I have done my duty and am very grateful." (L06)

"A feeling of accomplishment and that, despite having taken place remotely, it was possible to do practical tasks and assimilate all the proposed content." (L27)

"Completing this course was rewarding because I felt I could gain new knowledge, and it helped me to abandon the idea that the school year would be lost because of the pandemic." (L22)

5.7 Learners' negative feelings

However, some negative feelings emerged in the learners at the end of the course. Some learners reported being stressed and tired at the end of the course (see quotes from L08, L18, and L19). In addition, we perceived some learners' frustration for not enjoying the course the way they wanted (see quotes from L31 and L25). Others justified their frustration because of their lack of experience in scientific research (see quotes from L04 and L11). Also, we identified learners who felt sad because they wanted the course to be face-to-face or to have more time to be able to work on the contents more calmly (see quotes from L10 and L11).

"There is a feeling of stress and tiredness. Stress for fear of not doing a good job during the development of the activities. Tiredness due to the heavy routine that we have to fulfill the proposed deadlines." (L08)

"Moreover, I also left tired because keeping up with everything this month was very intense." (L18)

"I am not at all satisfied with my works." (L19)

"I believe that I could not absorb all the content in the way that I wanted/expected." (L31)

"I think that we can always improve and render more. I did, but I did not go more profound than what was proposed. In this sense, I understand that I left something to be desired." L25)

"I am unfamiliar with the content taught, although it is very interesting; for this reason, my learning was not as good as it could have been." (L04)

"The lack of research experience slowed down the execution of the activities, requiring periods of reflection and comparison to see if what I was doing made sense." (L11)

"I am sad that we did not get a chance to continue this course in person because I enjoyed being selected to present the paper on secondary studies, and it would have been nice to have more activities like this (in person)." (L10)

"A mixed feeling of satisfaction for having finished a commitment and, simultaneously, sadness because I enjoyed the area of Experimental HCI and would have liked more time to work on this course." (L11)

5.8 Relation of the course with academic activities

Another result identified was that the learners could associate the contents taught in the course with the activities developed in the academy. For example, some learners reported that the concepts would be useful for their Master's or Ph.D. (see quotes from L06, L10, and L12). In addition, one learner reported that the SMS and SRL content assisted in writing a scientific paper on the topic (see quotes from L36 below). Also, one learner mentioned that he learned about the importance of data replicability in academic research (see the quote from L25). Finally, one learner mentioned that he carried out the papers developed in the course as actual samples of research (see the quote from L08).

"These aspects will help me to be more careful so that my future publications and thesis are more robust, correct, and of higher quality." (L06)

"The topics learned cover well the range of activities to be performed in the master's program, which I found very important." (L10)

"These concepts will be of great importance in my future master's research." (L12)

"The mapping and systematic review classes, as well as the two activities regarding the mapping protocol, were of immense importance for the work. We have just finished the article regarding this mapping and will submit it in the coming weeks." (L36)

"I learned the importance of good writing of a paper with available data, clarifying what evaluation forms were used in the study so that another researcher could replicate it." (L25)

"I fulfilled the requirements of the activities and tried to go further with my group mates, looking at the assignments as "samples" of real research and not as activities of a discipline." (L08)

5.9 Relation of the course with industrial activities

Finally, we identified that some learners could associate the contents of the course with professional activities developed in the industry. For example, some learners mentioned that several contents learned can be applied in the job market (see quotes from L02 and L33). In addition, one learner mentioned that he would use concepts learned in the discipline in the company where he works (see the quote from L01).

"I saw many topics that I did not know about, and many of them can also be applied in the job market." (L02)

"I believe that the exercises concerning exploring the literature and the practical examples of how to evaluate user experiences were beneficial for both the Ph.D. work and for application in the industry." (L33)

"I loved the course and seeing the differences in research approaches in the market and academia. It was very enriching, and I will certainly use several concepts learned during the course in the company." (L01)

6 Analysis from the LX perspective

In this exploratory study, we sought in the qualitative analysis the elements of LX based on the questions of Huang et al. (2019) to represent learners' experience in the discipline of Experimental HCI in the context of remote learning. The LX elements and their questions are: a) Value (Do learners value the educational technology?); b) Usability (Do the learners find the educational technology easy to use?); c) Desirability (Do learners enjoy engaging with the educational technology?); d) Adaptability (Do learners find the technology personally adaptive?); and e) Comfortability (Do the learners feel comfortable with the educational technology?).

For the Value element, learners considered comprehending content such as planning and executing SMS and experimental studies. For example, LO6 shared that: *"I have already had experience designing and conducting systematic reviews, but the course has allowed me to identify details in the planning that will certainly help me in future reviews"*. Additionally, learners enjoyed discovering technologies that assisted them in quantitative and qualitative analysis, such as SPSS and Atlas.ti. For example, L35 said that: *"I think the last two tasks were excellent because they allowed me to learn software that I had never used before"*. Additionally, the learners valued what they learned, even though it was Experimental HCI content/topics. For example, L23 told that: *"I think that even though it is an HCI course, the concepts go beyond this. Another point is that every learner at this stage of graduate school should have these concepts covered, even if at a theoretical level for research reading"*. The learners believe they will be able to apply this knowledge in their research and professional life in the future. For example, L36 said that: *"(...) the learning obtained in the course opened the range of my knowledge; all the content passed and suggested helped me and will help me in my steps toward the doctorate, research, and professional life"*. The learners were also satisfied with their performance in the course even if some had problems with their internet connection because they could follow the video classes recorded and made available on Moodle. For example, L01 and L28 shared respectively that: *"I loved the course (...)"*; *"I turned in all the activities and only missed one class due to a lack of internet"*. The learners also commented that it was possible to solve their doubts through different means, such as chatting on the BBB platform, e-mail, and during the synchronous class. For example, L06 said that: *"I was able to perform very well throughout the course because all the doubts I had I was able to solve by different means."*. Finally, the learners believe the course contributed to their research to make it more robust and correct. For example, L06 shared that: *"These aspects will help me to be more careful so that my future publications and thesis are more robust, correct, and of higher quality"*. In summary, the findings indicated that the methodology of the course may have contributed to learning educational content and technologies, supporting academic

research in Computing; for this reason, the learners valued and were satisfied with the course.

For the Usability element, one learner believes that the last two tasks of the course on the quantitative and qualitative analysis contents allowed him to learn tools, such as SPSS and Atlas.ti. For example, L35 stated that: *"I think the last two tasks were excellent because they allowed me to learn software that I had never used before"*. It is believed that the support of the assistants and the teacher may have facilitated the use and learning of these and other educational technologies. For example, L10 shared that: *"The teacher has a wealth of knowledge and mastery in all the subjects presented and discussed, which gives me confidence about the quality of the course I took"*; *"I also congratulate the assistant, who was willing to be an assistant in the course and was always ready to answer questions clearly and concisely"*. In short, the communication between learners and the feedback from the assistants and teacher contributed to facilitating the use of the tools used in the course in the remote learning context and, therefore, the learning of the content. However, some learners felt that the class period was short for learning. For example, L23 said that: *"I think the period was too tight for the proposed activities. These are contents that take time to learn"*. For this reason, some of the content could not be deepened. Moreover, the tools could no longer be used for the execution of practical tasks.

For Desirability, findings indicated that learners felt more confident to conduct academic research by using educational technologies to facilitate the automation of planning, executing SMSs, and analyzing data from experimental studies. For example, L34 said that: *"At the end of the course, as we learned many new things, I feel confident that I can develop better and higher quality work from now on"*. Learners also felt happy and inspired to have completed the course in such a delicate pandemic period through synchronous activities using the BBB and asynchronous activities using Moodle. For example, L15 and L10 said respectively that: *"I am happy to have completed the course and learned concepts that will help me write the dissertation"*; *"I am inspired because the issues covered have further opened my mind to conducting more rigorous, systematic, and organized research"*. However, other learners felt stressed, tired, and even sad for not having taken advantage of the course as much as they would have liked due to some difficulties in remote learning, especially concerning time and prior knowledge about the content and educational technologies used in the course. For example, L08 and L11 said that: *"There is a feeling of stress and tiredness. Stress for fear of not doing a good job during the development of the activities. Tiredness due to the heavy routine that we have to fulfill the proposed deadlines"*; *"A feeling of (...) sadness because I enjoyed the area of Experimental HCI and would have liked more time to work on this course"*. Overall, even in the face of a pandemic, the results indicated that some learners engaged positively in the course.

For Adaptability, the findings revealed that the teacher and the assistants were proactive in helping the learners to remove doubts quickly and understandably. For example, L18 shared that: *"I thank the teacher and the assistant for their availability and for always answering my questions quickly"*. Questions were answered in the BBB chat during synchronous classes. The assistants would let the teacher know at an opportune time so that no questions went unnoticed. The assistants were also free to answer and support the learners in their difficulties using educational technologies, such as organizing and making activities available on Moodle. Based on the responses, it was perceived that the teacher acted with patience and friendliness in the teaching process, taking into consideration the limitations and possible difficulties that the learners were facing in attending the classes during the pandemic. For example, L19 and L29 said respectively that: *"The teacher is very patient and friendly"*; *"The teacher was very approachable and always showed interest in helping"*. The findings indicated that the methodology of the course adapted for remote learning contributed to the learners feeling confident in their course.

Regarding Comfortability, it was not possible to identify aspects in the analysis. Furthermore, there were no specific questions in the questionnaire about this element. Because it was in the remote context, we also had no control over this variable because each learner's environment was different during the lessons. For example, one learner may have attended the synchronous class on his smartphone and another on his laptop or desktop. Also, one learner may have attended class in a noisy environment and another in a quiet one. As no participant commented on this element, it was impossible to discuss it. However, about this element, it is worth noting that the teacher tried to adapt the didactics and evaluation of the course, made the weekly workload more flexible, and also made the activities available to the learners, considering the eventual access problems in the remote context, so that the participants felt comfortable.

7 LX Guidelines for Remote Learning

Based on this exploratory study, we have prepared 16 guidelines to support the design of other courses and activities focusing on LX. These guidelines are related to decisions and learning that we had in this exploratory study and that we deem relevant for the success of LX in remote learning. This set of guidelines was organized from the five elements of LX analyzed in this exploratory study. Table 1 shows the LX guidelines for remote learning. This organization was adopted to facilitate the use of the guidelines by professors and researchers, giving them the freedom to select which elements of the LX they would like to apply in their activities.

Guidelines (a), (b), (c), and (d) relate to the Value element. Thus, guideline (a) encourages learning by using educational technology. In Kuhn et al. (2009), this practice helped to contextualize the content and engage learners in their learning process. Moreover, when supported by a well-defined structure, this practice collaborates with the creative process of learners (Lammer et al., 2015). Guidelines (b) and (c) encourage learning through social interaction. For Katuk et al. (2013), learner-teacher and learner-learner interaction modes are an integral part of developing an effective learning experience. Finally, guideline (d) contributes to developing an important skill for life in the 21st century, which is Responsibility. In Butola (2021), the importance of helping learners in their professional growth is shown. Thus, Rodrigues et al.

Table 1. LX Guidelines for Remote Learning

Elements	Guidelines
Value	a) Allow the learner to put into practice the contents learned in their academic research; b) Allow the learner to include their advisor, that can also collaborate in the learning process; c) Allow the learner to exchange experiences and knowledge through collaborative activities; d) Encourage learner responsibility, for example, by having them email a report at the set time;
Usability	e) Allow the learner to learn new educational technologies related to the contents; f) Provide ongoing support and feedback to learners on educational technologies used in activities;
Desirability	g) Allow the learner to select the tools they want to use; h) Allow the learner to choose the colleagues he wants to work with; i) Allow the learner to decide the topics he would like to deepen within the practical work; j) Allow the learner to choose the support material they prefer;
Adaptability	k) Propose activities that the learner can visualize their applicability in other contexts (such as beyond the classroom); l) Consider the diversity of learners (including individual and collaborative lessons); m) Give the learner an opportunity to express himself and ask questions, especially those who are shyer and have difficulties; n) Make the materials available before classes so that the learner can read, prepare, and write down curiosities, ideas, and possible doubts;
Comfortability	o) Allow the learner to access the materials and watch the class on the device they find most comfortable; p) Suggest that the learner choose a quieter environment to carry out the activities;

(2016) considered developing and evaluating Responsibility in learners as a relevant characteristic of the profile of educational software developers, as well as other professionals.

Guidelines (e) and (f) are related to the Usability element. Guideline (e) encourages the interactivity of contents through different educational technologies, which can make the process more attractive for the learner. For Butola (2021), educational technologies can support all learning fields, such as cognitive, psychomotor, and affective. At Magyar and Haley (2020), the clean and attractive design of the educational technology made learning enjoyable. In addition, the ease of use made it possible to achieve the learning objectives. Guideline (f) allows learners to feel more secure in the activity that they need to do through support. In Luchini et al. (2004), the support made learners participate in learning activities consciously. For Stanley and Zhang (2018), support and feedback to learners influence the success of LX directly and indirectly and contribute to learner involvement and satisfaction in the course.

Guidelines (g), (h), (i), and (j) are related to the Desirability element. These guidelines seek to give autonomy to the learner through their preferences to place them as protagonists of their learning. In Donelan and Kear (2018), learners had access to a series of online educational technologies. Still, they could use other tools that were more familiar, which provoked a sense of pleasure and reward in learners when performing the website creation activity. In Chen and Liu (2008), learners were given control to decide their learning paths, including choosing their favorite navigation tools and preferred presentation formats. Furthermore, learners could decide the sequence of subjects to be learned as well as the contents they wanted to learn. Learners need this freedom because there are several dimensions of cognitive styles, such as visualized versus verbalized. The results of the Chen and Liu (2008) study indicated that cognitive style is an important factor influencing learners' learning patterns.

The guidelines (k), (l), (m), and (n) are related to the Adaptability element. Guideline (k) helps assign meaning to learners' knowledge through relevant activities (for learners to do, not just to receive a grade). Thus, Mutlu (2015) suggests that LX be part of the learner's life experiences, contributing to lifelong learning. Guideline (l) encourages proposing different activities to learners due to different cognitive styles. In this context, in Magyar and Haley (2020), learners were unmotivated for educational technology after realizing few available activities. In Stanley and Zhang (2018), it was observed that if learners had performed more activities, they could have had greater learning gains. Guideline (m) seeks to involve learners with greater difficulties, for example, due to excessive shyness. In Magyar and Haley (2020), it was shared that the lack of appropriate support makes the learner devalue educational technology. However, this little acceptance can also extend to the teacher or the content taught because the learner is not confident enough. On the other hand, in Stanley and Zhang (2018), it was presented that the support satisfies the learners in the course, which can help them have more security and comfort in their activities. Guideline (n) was inspired by the flipped classroom approach, which can enable more organized and targeted classes. For Rosa and Valentim (2021), this approach is a way to encourage self-learning and allow greater interaction between learner and teacher. In Martinelli and Zaina (2021), this approach promoted a new configuration of online classes and encouraged learners to work actively.

Finally, the guidelines (o) and (p) are related to the Comfortability element. These guidelines seek to make learners more comfortable in the learning process, selecting the type of educational technology that best matches their needs. In Chapman et al. (2016), learners were comfortable using electronic books, but they were even more comfortable using printed books. For Graziano (2018), when levels of comfort and pleasure increase, motivation, effectiveness, and competence also increase. In this way, the Comfortability guidelines and others are important and contribute to a better LX with educational technology.

8 Discussions

We also tried to look at the results from the perspective of the learning objectives defined and presented by the teacher in the course. This practice seeks to emphasize the element LX Value perceived in this experience report because it reveals the achievement of learning through the other elements. To achieve value in learning, this exploratory study followed the decisions presented as guidelines in this article. We also sought to follow the teacher's lesson plan to meet the requirements proposed and expected by the learners.

In this context, the overall objective of the course was to "plan, execute, and analyze primary studies (such as controlled experiments) and secondary studies (such as systematic mapping studies and systematic literature reviews)." From this, we observed in the findings that the course allowed learners to identify details of how to plan systematic literature reviews and controlled experiments that could assist them in current and future research. We also perceived that the course contributes to preparing young researchers, such as Masters and Ph.D. students, through the lectures and practical tasks, allowing the learners to contact and include their supervisors in the learning process. In this way, the learners could define and mature their research, exchange experiences and knowledge, and receive feedback in an interdisciplinary way since they were learners from different areas of Computing. Finally, we also observed that the discipline could foster undergraduate research, which is optional for this level of education.

Next, some pertinent Specific Objectives (SO) are presented, such as (i) Experiment with different tools and resources to support qualitative and quantitative analysis; (ii) Demonstrate the ability to have critical analysis and decision-making informed by theoretical or empirical knowledge; (iii) Develop autonomy in individual and teamwork; and (iv) Develop oral and written communication skills. Regarding SO (i), the learners commented that the course "allowed them to learn software they had never used before," such as Atlas.ti in practical task 4 on qualitative analysis. In addition, the teacher encouraged the learners to identify other supporting tools, such as SPSS or R, for quantitative analysis referring to practical task 5; On SO (ii), the learners would start an activity by defining the research problem that requires critical thinking. To do this, they could read the materials, re-watch the video lessons, ask questions in class, execute their planning, and prepare a report containing the steps and results obtained from this process. These activities require a commitment but also a critical analysis on the part of the learner. They had the freedom to make decisions, such as the choices of tools and support materials, and to define the objectives of their work, being able to use their research. Concerning SO (iii), the learners believe that they could fulfill the requirements of the activities together with their peers, looking at the activities as real research and not just as a task of a course, as they saw usefulness and applicability for their present research. In this context, the teacher proposed both individual and collaborative practical tasks. However, the learners could work alone if they wished, as some had difficulties with time and an internet connection to get together. Another situation could be due to shyness. In this last case, the course assistants tried to be more present, checking if everything was right and giving quick feedback. Finally, about SO (iv), we noticed that written communication was better stimulated than oral communication because the students practiced writing through the reports delivered for each practical task. Oral communication occurred through the questions the students asked the teacher and the course assistants, besides the internal communication performed by the working groups. Commonly, in each class, during the face-to-face period, the teacher presents to the students the next class topic and provides them with basic material for study. In the next class, the teacher chooses one learner to succinctly present their understanding of that content to their classmates to encourage oral communication.

In short, we highlight some lessons learned about remote learning: 1. what can be maintained (recorded and made available classes allow learners to learn at their own pace and replay them as many times as deemed necessary; practical tasks help assimilate the content; continuous support and feedback to learners contribute to removing doubts and carrying out activities); 2. what needs to be rethought (the reduced workload did not allow some contents to be deepened and tools to be learned); 3. what could be improved (think about ways to present the Experimental HCI content to learners from other areas of Computing).

9 Threats to Validity

The results of this experience report may contribute to other similar disciplines that need a remote learning context. However, this study had some threats that may affect the validity of the results and thus deserved to be highlighted. The threats were categorized according to the (Wohlin et al., 2014) approach. Therefore, we identified internal and external, completion, and construct threats. Internal and external threats were treated together because it is a remote experiment. In this sense, we tried to mitigate them during the course to reduce possible risks.

Concerning internal and external validity, the short period of remote learning as a response to face-to-face teaching can be considered a threat because it includes adapting learners, assistants, and teachers to this type of teaching. Even though the teacher is from the Computing area, adapting to remote learning required experience and effort in elaborating support materials, tests to choose the resources used, and others. Regarding the data collection questionnaire, the teacher emphasized that it would not be worth a grade to reduce bias in the learners' answers. In addition, the teacher set five days to answer the questionnaire so that all learners could provide their learning experiences, anticipating the possible problems of time and internet connection.

Concerning completion validity, the sample included only learners from a single institution. However, the sample can be considered heterogeneous, represented by undergraduate, master's, and doctoral learners. Even so, we recognized that in future research, a more significant number of participants should be considered under the context of different disciplines and university settings to achieve generalizable results. Overall, the findings and strategies reported in this study may

contribute to future similar experiments.

Regarding construct validity, the study did not use some data collection techniques, such as interviews and focus groups, that could help in a deeper understanding of attitudes and learning experiences. One of this study's limitations was the non-use of metrics to measure the elements of LX. One way to minimize this limitation was to map learners' responses onto LX elements. Another limitation would be not using a questionnaire previously validated in the literature. Consequently, the Comfortability element was not clearly observed in the analysis, as there was no specific question in the questionnaire about this element. However, the questionnaire was designed by an expert in Computer Science in Education and submitted to two rounds of revisions by two experts in Experimental HCI to mitigate this risk. When there were disagreements, the three researchers discussed until they reached a consensus on its suitability to be used in the course for data collection.

10 Conclusions and Future Work

This paper aimed to present learners' experiences in the Experimental HCI course in the remote learning format. The analysis presented was based on the LX elements identified in the literature. The teaching methodology was adapted to serve the learners in remote learning. The teaching methodology consisted of synchronous and asynchronous classes. The learners had to prepare for the synchronous classes by reading papers and book chapters in the course. This strategy ensured that the learners would receive the same content as face-to-face teaching since the special remote learning period courses were more flexible, with fewer synchronous classes and more asynchronous activities. The course had a workload of 60 hours, with six synchronous meetings.

Based on the qualitative results, we identified that the methodology adopted for remote learning allowed learners to comprehend new content and educational technologies (Value); however, some learners said that the practical tasks allowed them to learn new tools (Usability); even in the face of some difficulties with the educational technologies in remote learning, the learners were able to remain optimistic with positive feelings about their performance and learning (Desirability); in addition, the teacher and assistants were essential in the process of adapting the course, helping the learners quickly in using the educational technologies and understanding the content (Adaptability). In this exploratory study, no quotes related to the element of Comfortability were identified, mainly because it is a remote context. In short, even in the face of difficulties, we perceived that the experience was valuable for the learners, believing that they can apply this knowledge in their research and professional life in the future.

In future work, we intend to apply the guidelines in a remote learning context to observe the impact of the elements of LX. For this, the questionnaire will be improved by including questions that allow evaluation mainly of the elements of LX. Posteriorly, it will be possible to evaluate LX of learners of other courses offered in the online modality. Finally, we hope this article will support teachers and LX designers looking for ways to improve the learner experience using educational technologies in the remote learning format.

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