Acceptance Analysis of a Learner Experience Evaluation Model

Gabriela Corbari dos Santos[1]**, Deivid Eive dos S. Silva**[1]**, Letícia Mara Peres**[1]**,
Natasha M. C. Valentim**[1]

[1]Departamento de Informática – Universidade Federal do Paraná (UFPR)
Caixa Postal 19.081 – 81.531-980 – Curitiba – PR – Brazil

`gabrielacorbari@ufpr.br`, {`dessilva,lmperes,natasha`}`@inf.ufpr.br`

Abstract. *Learner eXperience (LX) is defined as the perceptions, answers, and performances of learners interacting with learning environments, educational products, and resources. Thus, we proposed a model to assess and support the improvement of the learner's experience using Digital Information and Communication Technologies (DICTs) during learning, called Learner Experience Evaluation Model (LEEM). This paper presents the acceptance analysis of the LEEM and its evolution with twelve learners and one higher education teacher. The acceptance evaluation carried out in this study is important because it helps to improve and verify the contribution of the LEEM, based on the perception of learners and teacher, who are the stakeholders in the educational process.*

1. Introduction

The term Learner eXperience (LX) is a concept derived from User eXperience (UX), according to Kawano et al. (2019). The definition of UX according to ISO 9241-210 is user perceptions and responses that result from the use or anticipated use of a system, product, or service. LX, according to Huang et al. (2019), is defined as learners' perceptions, responses, and performances through interaction with a learning environment, educational products, and resources, among others. Schmidt and Huang (2022) present and define that the term LX focuses on a specific class of user (the learner) engaged in a specific task (related to learning) while using a distinct type of technology (a technological tool designed for learning). Huang et al. (2019) add that the person evaluated in LX is the learner, just as the person evaluated in UX is the user. The term Learner, presented by Soloway et al. (1994) is used to refer to students who are constantly learning or to professionals who put themselves in a position to learn, subjecting themselves to all the challenges faced when using Digital Information and Communication Technologies (DICTs). In our paper, it was determined that the term LX used is specifically related to the learner's experience when interacting with DICTs. Therefore, there are a need to investigate experiences that facilitate learning and the mastery of knowledge [Correa et al. 2021]. In addition, there are a need to support learners in educational experiences that were out of their reach, seeking protagonism in the learning process [Soloway et al. 1994].

Huang et al. (2019) recommend taking into account the diversity of learners and also their learning preferences to be able to evaluate all aspects of the experience, thus achieving a more holistic LX evaluation. Holistic evaluation refers to the maximum number of aspects evaluated in the learner's experience. Thus, Huang et al. (2019) believe that LX with DICTs can be evaluated and improved through different elements of LX,

such as Value, Usability, Adaptability, Comfortability, and Desirability. The LX elements refer to the components that guide the LX evaluation process, making it possible to verify various characteristics of the experience, such as emotions in learning. Therefore, the LX elements vary depending on the purpose of the evaluation.

From this, the Learner Experience Evaluation Model (LEEM) was proposed. The LEEM aims to evaluate and to support the improvement of LX with the use of DICTs. It is organized into three evaluation stages (pre, during, and post) to allow continuous monitoring and recording of the progress of LX during an educational activity. It consists of three checklists and a set of questions. Based on this, an acceptance analysis was carried out with learners and a higher education teacher about the LEEM model. The study aimed to assess the acceptance of the LEEM model in a real context. The evaluation of the acceptance of the LEEM model was carried out using the Technology Acceptance Model (TAM) questionnaire [Venkatesh and Bala 2008]. Evaluating the acceptance of technology is important because it allows us to assess the participant's perception of a new technology. As a result, researchers have developed various technologies to understand the factors that influence its acceptance by its participants, and TAM model is so far the most powerful model for explaining behavior in new technology acceptance, especially in the adoption of digital technology [Najib and Fahma 2020].

In this study, 12 learners and one teacher from the Software Engineering (SE) class of the Computer Science (CS) and Biomedical Informatics (BI) course at the [university's name] in [university's country] answered a questionnaire. The participants' responses were obtained through the indicators of TAM3, being ease of use, perceived usefulness, and intention to use, which were analyzed quantitatively and qualitatively. The results showed, for example, that one learner thought LEEM model intuitive, while another participant thought LEEM too generic.

In general, the study presented in this paper contributes to the field of Informatics in Education, Computing Education and also Human-Computer Interaction, as it makes it possible to evaluate learners' experiences with the use of DICTs. Understanding LX during the learning process is fundamental, as it provides insights for educators into the importance of reviewing and, if necessary, modify the DICTs used, according to the individual needs of the learners [Martinelli and Zaina 2021]. This is also important to avoid situations where learners feel uncomfortable with the DICTs, promoting more effective interaction and a more positive learning experience [Huang et al. 2019]. In addition, LEEM model can help educators rethink their teaching and learning strategies when they notice that learners have reported difficulties with the DICTs they have adopted. Finally, educators can also observe whether learners remain motivated in the educational activity and what could be improved.

2. Related Works

In Yeh and Chen (2019)'s work, LX was evaluated about collaborative writing using the Google Docs tool in an English writing course. For the educational activity, learners worked in pairs or groups of up to four learners, meeting for two hours a week in the classroom. Yeh and Chen (2019) investigated the learners' attitudes towards LX using a survey. The survey has 15 items and was developed based on the four indicators of Davis (1989): Perceived ease of use, Perceived usefulness, Attitude towards use, and Intention

to use. About the Perceived Ease of Use indicator, the authors of the study pointed out that most of the learners were familiar with the tool, yet some learners reported that they were eager to use it. For the Perceived usefulness indicator, 90.9% of learners agreed that the tool was useful in collaborative writing tasks [Yeh and Chen 2019]. For the Attitude towards use indicator, 36% of learners considered the collaborative writing task difficult; 45% of learners were neutral, i.e. they considered it neither difficult nor easy; and only 18% of learners considered it easy. Finally, for the Intention to Use indicator, 72.7% of learners reported that they used the tool to complete the task and that they enjoyed doing it. Yeh and Chen (2019) state that only 18.2% of learners gave negative feedback on the use of the tool, and that most learners were satisfied with using the tool to carry out collaborative writing tasks, and would also be willing to use it again for similar tasks.

Ruiz and Snoeck (2018) in their work investigated LX by creating a user interface model through the adaptation of Kirkpatrick's model using the Feedback-ENabled Interface Simulation (FENIkS) tool in a Technology Enhanced Learning (TEL) environment. To adapt Kirkpatrick's model, the authors of this work considered existing evaluation models, using the Method Evaluation Model of Moody (2003), which is based on the Technology Acceptance Model (TAM) of Davis (1989). Thus, one of the adaptations made was to the Reaction Level of Kirkpatrick's model, through the inclusion of the Perceived Usefulness indicator. The indicator was included to measure affective reaction and perceived usefulness through several questions, such as: Using the didactic tool was a positive experience; I am enthusiastic about using the didactic tool in this kind of course; and others. Thus, through this adaptation of Kirkpatrick's model using FENIkS, important insights were gained, such as the extent to which the FENIkS tool helped learners learn design. Also, when asked if they had a positive learning experience, most learners agreed with the sentence. Therefore, during the case study, it became clear that FENIkS was useful for the learners' learning.

In their work, Camilleri et al. (2013) evaluated LX in a 3D immersive environment using the AvayaLive tool. They carried out a case study to measure the effectiveness of the 3D immersive world using the Technology Acceptance Model (TAM) and the combination of collaborative practices. In their work, the authors evaluated the LX using a pre-and post-test, and also using the traces left by the learners in the tool, known as "breadcrumbs". The "breadcrumbs" are used to be able to understand and evaluate what the learners are doing and how they are navigating through their learning experiences. Camilleri et al. (2013) evaluated learners in an immersive 3D environment in such a way that learners were able to collaborate and share their ideas, thus describing the concept of "shared workspace". Some of the questions that the case study seeks to answer were: Which learning objects in-world are more effective for promoting learning?; Does the use of an immersive 3D space enable a greater access to learning?; What modalities of learning can stimulate learner engagement? The authors of this work presented that the data collected includes the actions of the learners, but that in the future they intend to use other data to provide a more integrated picture of the learners and also the learning paths chosen throughout the 3D immersive environment. In general, Camilleri et al. (2013) sought to understand the level and depth of engagement achieved by learners within the 3D immersive environment.

Unlike the works that evaluated LX at one or two moments (during and/or at the

end) of educational activities, the LEEM model suggest an evaluation before, during, and after an educational activity, as it is possible to continuously monitor and record the progress of the LX. It is important to evaluate LX in different ways and consider different elements, as this can generate more effective learner experiences, which according to Huang et al. (2019), result in engaging and memorable educational experiences. Moreover, in our study, we chose to adopt the TAM3 model [Venkatesh and Bala 2008], which is the most recent version used to analyze the acceptance of a new technology, proposed by Davis (1989).

3. LEEM Model

LEEM was organized into three stages of evaluation to allow continuous monitoring and recording of LX's progress during an educational activity. The first stage, called pre-evaluation, aims to identify the learners' profile, considering their difficulties and needs regarding their learning experience. Pre-evaluation can help form groups for collaborative activities, whether at school or university. It is suggested that the teacher apply group formation techniques according to their familiarity. For example (Figure 1), in the item "I prefer to work in a way", the learner can select the option closest to the word they want, "practical" or "theoretical" [Dos Santos et al. 2023].

Figure 1. Part of the LEEM pre-evaluation checklist.

In the 2nd stage, called during-evaluation, LX evaluation takes place during the educational activity. This evaluation seeks to record the feelings and information of the learning experiences from both the learner's and the teacher's point of view. For this reason, the checklists that the learner and teacher will answer have similar sentences, to assess both their perspectives on the learning process. The learner will report their feelings using the Self-Assessment Manikin (SAM) scale [Lang 1980], such as about finding support material (Figure 2). The learner will also report their record of the learning experience using a 5-point Likert scale about their preference for using DICTs for learning. The teacher, meanwhile, will assess on a 5-point Likert scale whether they agree that the learner enjoyed accessing the support material (Figure 3). It is recommended to apply these checklists after 50% of the educational activity because both the learner and the teacher will already have had some experience to give their feedback. For example, if the educational activity lasts two weeks, then these checklists should be applied at the end of the first week [Dos Santos et al. 2023].

The third and final stage, called post-evaluation, aims to evaluate the learner's experience after completing an educational activity using DICTs. For this stage, it is suggested to apply the focus group technique to allow learners to answer open questions and report on their individual and collective experiences during the educational activity. In this stage, the learners reflect on and self-assess their learner's experience, and have the freedom to be active and critical subjects in their learning. For this stage, it is suggested

Figure 2. Part of the LEEM during-evaluation checklist (learner).

Figure 3. Part of the LEEM during-evaluation checklist (teacher).

that the teacher act as a moderator during the discussions with the learners. Learners can express themselves randomly, and everyone doesn't need to answer all the questions. As an example, there is "Have you ever experienced a situation similar to the activity carried out? Comment." and "Did you find the activity interesting, stimulating, or thought-provoking? Comment.". The current full version of LEEM is available on Figshare[1].

4. Acceptance Evaluation

An evaluation was carried out to assess the acceptance of the use of LEEM in a real context using the TAM3 [Venkatesh and Bala 2008] and its indicators: Ease of Use, Perceived Usefulness, and Intention to Use in the Future. This study was approved by the Ethics Committee of the Federal University of Paraná (UFPR).

4.1. Population and Sample

The study was carried out with learners enrolled in the SE class of the CS and BI course at UFPR, and with the respective teacher of this class. The teacher was invited to take part in the study via e-mail. The teacher was given instructions on how to take part in the study, after her voluntary acceptance. Next, the researchers and authors of this paper, together with the teacher, invited the learners to one of the classes and presented the aim of the study to them. The study's data collection instruments were presented, depending on whether the learners expressed an interest in taking part in the study. Of the 23 learners of the SE class, only 12 answered the technology acceptance evaluation questionnaire, according to TAM3. The instruments will be presented in Subsection 4.3.

---

[1]https://figshare.com/s/9324295232db1cde6064

4.2. Context

The practical educational activity of the SE class that used LEEM to assess LX was the last Practical Work of the semester. The aim was to carry out software development planning, taking into account one of the software development methodologies already pre-defined in the same class. The activity was organized with the preparation of a report and its presentation. The educational activity was presented to the learners in May 2023, together with the LEEM. The teacher suggested carrying out the educational activity in groups, with each group having a maximum of three members.

The teacher advised that each group use a software project manager, and also that they use the material from Wazlawick (2019). As a complement to the educational activity, the teacher left it optional to carry out project planning with estimates. The final version of the report was set for June 2023. In addition to providing two lessons for the presentation of this educational activity with a time limit of at least 5 minutes and no more than 7 minutes per group.

4.3. Instruments and Execution

When they agreed to take part in the study, the participants signed the Informed Consent Form (ICF). After completing the ICF, the teacher and the learners answered the characterization questionnaire, and the learners also answered the Pre-evaluation checklist (1st stage). The teacher then taught her lesson as normal. On completion of 50% of the educational activity, as provided for in the LEEM model, the During-evaluation (2nd stage) was applied.

The teacher instructed the learners to complete the Learner During-evaluation checklist, and the teacher also completed her During-evaluation checklist. At the end of the activities, the teacher asked the learners to complete the Post-evaluation checklist (stage 3). At this point, all the participants answered the technology acceptance evaluation questionnaire, according to TAM3. The instruments are available at Link[2].

5. Results

The data obtained from the LEEM general evaluation questionnaire was analyzed quantitatively and qualitatively. The quantitative data was analyzed using descriptive statistics, looking at the participants' responses about the three TAM3 indicators [Venkatesh and Bala 2008]. The qualitative data was analyzed using the Grounded Theory (GT) method defined by Corbin et al. (1990). However, the data was cleaned, coded, and organized before analysis. GT has three stages in the coding process: open coding (1), axial coding (2), and selective coding (3). The first stage is open coding, in which the data is coded according to the answer given by each participant to each question. Subsequently, in axial coding, the codes were grouped according to their properties and related to each other, thus forming categories that represent their characteristics. Selective coding was not carried out as the intention was not yet to create a theory. This is because the open and axial coding stages were sufficient to understand the participants' perception of using LEEM and make the necessary adjustments to its content, based on the perceptions of the learners and teacher.

---

[2]https://figshare.com/s/9324295232db1cde6064

5.1. Characterization of the participants

Regarding the data on **characterization of the learners' profile**, gender was collected, where it was noted that 83% (N = 10) are male and 17% (N = 2) did not want to identify themselves. Regarding the age of the learners, 100% (N = 12) are between 20 and 30 years old. As for looking for new DICTs to support learning, in addition to those suggested by the teachers, 42% (N = 5) of the learners usually look for new DICTs, and 58% (N = 7) of the learners don't usually look for new DICTs. When asked if LX had ever been assessed in any class, 100% (N = 12) of learners said no.

Regarding **characterization of the teacher**, she is female and between 51 and 60 years old. She has been using DICTs to support teaching and learning since the beginning of her teaching career. When asked if she had ever assessed LX in any of her classes, the teacher said yes and reported that she had done so in the Introduction to Computer Science class during the pandemic and in the SE class using the Google Forms.

5.2. Quantitative Analysis

The Ease of Use indicator defines the degree to which a person believes that using a specific technology would be easy using the following questions: (PE1) My interaction with the LEEM model checklists was clear and understandable, (PE2) Interacting with the LEEM model checklists did not require much of my mental effort, (PE3) I find the LEEM model checklists easy to use and (PE4) I find it easy to use the LEEM model checklists for my self-assessment of the experience with the use of DICTs. The PEU1, PEU2, PEU3, and PEU4 bars in Figure 4 show the learners' perception of the Ease of Use indicator. The graph's vertical axis represents the affirmative of the indicator and the horizontal axis refers to the degree of acceptance by the learners. Codes have been added to the bars to represent the respective evaluations of the participants (P1, P3, P4, P7, P9, P10, P11, P17, P19, P20, P21, P22).
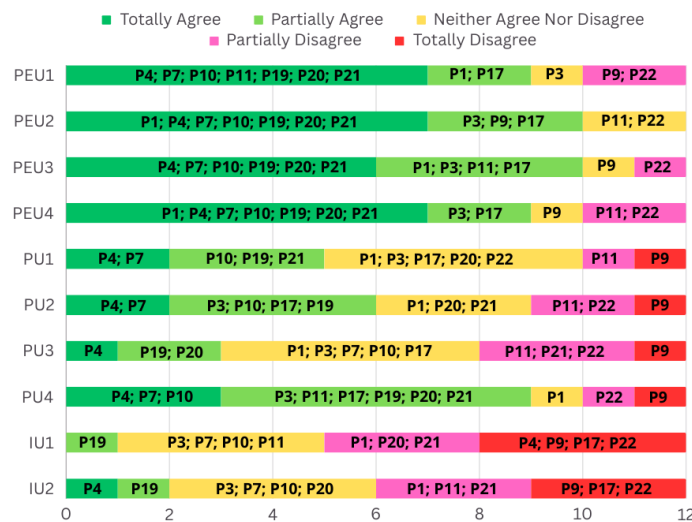

Figure 4. Results of the TAM indicators.

In Figure 4, it can be seen that, in general, most of the participants were optimistic about accepting the LEEM checklists, demonstrating that they were easy to use. However, for P9 and P22, the interaction with LEEM was unclear and understandable (PEU1). This

is believed because the scales on the LEEM checklists did not fully cover the recording of feelings, as reported by P9. We also found that P11 and P22 partially disagreed with sentence PEU4, demonstrating difficulty using the LEEM checklists. It is believed that P22 experienced problems because the LEEM is not geared towards the educational activity itself.

The Perceived Usefulness indicator defines the degree to which a person believes that technology can improve their performance through the following questions: (PU1) Using the LEEM model checklists can improve the performance of self-assessment about my learning experiences with DICTs in class, (PU2) Using the LEEM model checklists can enable me to increase the productivity of self-assessment about my learning experiences with DICTs in class, (PU3) Using the LEEM model checklists has increased the effectiveness of my self-assessment of my learning experiences with DICTs in class, and (PU4) I find the LEEM model checklists useful for supporting self-assessment of my learning experiences with DICTs in class. The four bars PU1, PU2, PU3, PU4 in Figure 4 show the learners' perception of the Perceived Usefulness indicator. In this indicator, there was generally a higher level of agreement with statements PU2 and PU4, which indicates that the LEEM checklists are useful for supporting self-assessment of the learner's experiences with DICTs in class. Learner P9 disagrees with sentences PU1, PU2, PU3, and PU4, perhaps because LEEM is not focused on the class. Overall, this learner showed difficulties in answering the LEEM checklists.

The Future Use Intention indicator defines the degree to which a person believes they would use the technology in the future through the following questions: (IU1) Assuming I have access to the LEEM model checklists, I intend to use them in other course activities and (IU2) Taking into account that I have access to the LEEM model checklists, I anticipate that I will use them at other times, such as other course subjects that allow me to self-assess my learning experiences with DICTs. Figure 4 shows the learners' feedback on Intention to Use in the Future (IU1 and IU2). In this indicator, P4, P9, P17, and P22 disagreed with these sentences, showing doubts about the future use of LEEM.

We also obtained the teacher's perception of the three indicators of the TAM3 model. Thus, for the Ease of Use indicator, there was total agreement with all the sentences. For the Perceived Usefulness indicator, the teacher was neutral in sentences PU1, PU2 and PU3. For the Intention to Use indicator, there was partial agreement with the sentences (IU1 and IU2). Overall, to identify the reasons for the disagreements about these indicators from both the learner's and the teacher's point of view, the comments they made in the open fields of the LEEM Model Evaluation Questionnaire, described in the following subsection 5.3, were analyzed qualitatively.

5.3. Qualitative Analysis

The categories and their respective codes identified in the qualitative analysis are presented below.

This category **positive comments from learners and teacher**, identified the fact that the LEEM checklists are intuitive (see quote from P4a) and useful in the learning context (see quote from P4b) for learners.

"They are very intuitive" (P4a)

"They are useful in a context of learning the tools" (P4b)

This category identified the fact that the LEEM checklists are simple, easy, and quick to use (see quote below from the teacher) for the teacher.

"They are simple, easy and quick to use" (Teacher)

It is worth emphasising that the LEEM will make it possible to evaluate the LX taking into account the diversity and preferences of the learners, as well as allowing this to be recorded at different times during the experience of the educational activities. It is believed that LEEM will make it possible to contemplate and evaluate various aspects of LX in the use of DICTs.

For this category **negative comments from learners**, it was identified that one of the participants believes that the LEEM checklist scales do not have answer options that contemplate what they would like to answer (see quote from P21), another participant believes that when the tool is already mastered there is no need for self-assessment (see quote from P4), another participant believes that LEEM is too generic (see quote from P17) and another participant believes that LEEM is not useful for assessing learning using DICTs (see quote from P9).

"Sometimes I felt that the multiple choice questions didn't have an option that covered 100% of what I would answer, but I also know that this is complex, as the language is very broad and in any case, some point won't fit completely into this answer format" (P21)

"Once the tools used have been mastered, there's not much need for self-assessment" (P4)

"It seemed too generalized to provide me with important insights " (P17)

"I didn't find the checklists particularly useful for self-assessment of my learning or use of DICTs" (P9)

For P21's quote, it should be noted that at the end of each LX element in the pre-assessment and during-assessment stages, the LEEM has a field called "Additional Information" so that the learner can report something if they feel the need. P4's quote is justified by the fact that the applicability of the LEEM is essential for analyzing whether the learner already has experience or even mastery of the DICTs used for the educational activity. In addition, the LEEM also evaluates the positive points of the LX. P17's quote is justified by the fact that LEEM seeks to evaluate and improve LX in the use of DICTs in different scenarios and contexts. Therefore, it was decided that neither the type of educational activity nor the type of DICTs would be restricted for use in the LEEM. P9's quote justifies the fact that the focus of the LEEM is not to assess learning, but rather the learner's experience of using DICTs.

For this category **teacher's neutral comments**, the teacher emphasized that the focus of the checklists is not on her learning experience (see teacher's quote). For this reason, she marked neutral agreement in sentences PEU1, PEU2, and PEU3 of TAM3's Perceived Usefulness indicator.

"As it's not 'my' learning experiences that were the focus of the checklists, I don't know how to answer these items" (Teacher)

The teacher's comment was supposed to be an assessment of the usefulness of LEEM as a means of collecting learners' experiences and using this information to improve LX throughout the educational activity, offering suggestions for the use of new DICTs or support materials. However, we realized that this was not so clear to the teacher, and it was up to us to improve this instruction to the teacher in the LEEM model.

For this category **learners' suggestions for improvement**, we identified the suggestions of presenting the definition of the acronym and examples of DICTs (see quote from P1) and making the LEEM checklists more concise (see quote from P7).

"It would be good to explain a little better what DICTs are and give some examples" (P1)

"Reduce the text in the checklists, make them more concise" (P7)

To quote P1, it should be noted that at the bottom of each LEEM page, there is a definition of the acronym for DICTs to make the learner more familiar with the term. To meet this request, the term was changed from black to blue. In addition, the instructions for the pre-assessment checklist were changed from "For the element Value about the value of using Digital Information and Communication Technologies (DICTs) in the learning process" to "For the element Value about the value of using Digital Information and Communication Technologies (DICTs) in the learning process, such as Kahoot! and Google Drive", giving examples of DICTs. P7's quote is justified by the fact that, as he didn't make it explicit where the checklist could be reduced, no action was taken in this regard. In future studies, we will analyze how this can be improved.

For this category **teacher's suggestions for improvement**, the following suggestions were identified: presenting the objectives of the LEEM application (see Teacher's 1st quote) and also having access to the LEEM material before its application (see Teacher's 2nd quote).

"Presentation to the teacher of the LEEM's aims, objectives and methods of application" (Teacher)

"I would like an explanatory method for the teacher, for example, presenting the students' checklists and the objectives of the questions. As a teacher, I didn't have access to this material before the application" (Teacher)

The LEEM material was made available to the teacher via e-mail after she agreed to take part in the study. The material contained the LEEM's objectives, objects, and methods of application, as well as the LEEM checklists. However, it was noted that if the LEEM instructions had been better formalized in a document, this situation would not have occurred. So we developed instructions for teachers with step-by-step instructions for applying the LEEM model, available at Figshare[3].

For this category **difficulties answering the LEEM**, it was identified that one of the learners missed the multiple answers per sentence in the checklists (see quote from P9a). Another learner believes that their feelings can influence when answering the LEEM checklists (see quote from P20). In addition, one learner reported that the instructions presented in the LEEM didn't match the scale (see quote from P9b).

---

[3] https://figshare.com/s/9324295232db1cde6064?file=44311688

"I also missed more options that allowed multiple answers on some of the items" *(quote from P9a)*

"I believe that, because it is a self-assessment, the model has a lot of influence on how the learner is feeling at the time of answering the checklists, so it may not reflect what they think about a particular checklist, either because they didn't pay attention or they forgot a case that happened to them" *(P20)*

"While the scale of the checklists was usually clear, I often realized that it didn't correspond to the tutorial that had been given, or seemed to add new items at random so that I clicked on the wrong option several times" *(quote from P9b)*

For the P9a quote, it was decided not to use scales with multiple choices, because if the learner felt the need to describe other information, at the end of each LX element there is a space called "Additional Information". About P20, it is justified that, like any type of assessment carried out with learners and teachers, the reliability and veracity of the information obtained depends directly on who is answering. The assessment is subjective so there can be influences from the context, from how you're feeling, which are part of LX's assessments. Regarding the quote from P9b, all the instructions/tutorials and the scales were revised to make them consistent.

6. Discussions

This study shows that the LEEM model is an essential component for evaluating learners' experiences with the use of DICTs. It is considered essential because it makes it possible to assess LX with the use of DICTs at different points in the educational activity, providing continuous monitoring and recording of LX. Ruiz and Snoeck (2018) observed in their work that learners learn better when a model used is appropriate to their needs and interests. In this sense, there was a need to evaluate the acceptance of the LEEM model, based on the perception of learners and teachers, who are the stakeholders in the educational process. It is believed that the results of the acceptance of the LEEM model show that it was possible to obtain satisfactory results for the Ease of Use indicator. However, for the Perceived Usefulness indicator, it is possible to note that in the first three sentences the result was not so satisfactory, showing that the model can still be improved. To this end, new studies will be carried out using the model.

Unlike the work by Ruiz and Snoeck (2018) which proposed a one-level adaptation of Kikpatrick's model using the Perceived Usefulness indicator, the assessment of acceptance of the LEEM model was carried out in a single questionnaire after the learners had finished using the LEEM model. Also, the questionnaire used in our study was developed based on the TAM3 indicators [Venkatesh and Bala 2008] with closed and open questions, where the study participants were able to evaluate, and if they felt the need, describe their perceptions of the LEEM model. Similarly to the work by Yeh and Chen (2019) where the majority of learners were satisfied with using the tool, the evaluation of the acceptance of LEEM was also positive, with the majority of participants finding the LEEM model easy.

The main lessons learned from this study are to improve the visibility of the term DICTs and to add examples of DICTs to familiarise the learner. Another lesson is to improve the teacher's instructions for answering the LEEM acceptance questionnaire,

as the teacher was expected to assess the usefulness of LEEM as a means of collecting learners' experiences, and this was not the case. Another lesson is that there was a need to formalize the teacher's instructions for using LEEM in a document, as the material was sent via email, but this was not enough. Overall, the aim of the study was achieved, as the LEEM model was used in a real context, and acceptance was evaluated. Through the results of the evaluation of the LEEM model based on TAM3 and its indicators, it was possible to analyze that for the Intention of Future Use indicator, the majority of learners had doubts about using it in the future, and for the other indicators evaluated, the majority of learners evaluated LEEM positively. This may indicate that the LEEM model is easy, but that there are doubts about future use.

7. Conclusions and Future Work

This paper presents the acceptance of LEEM model through learners and teacher evaluations. The evaluations of the acceptance of LEEM were carried out during an educational activity on the SE class at a UFPR in Brazil. Twelve learners and one higher education teacher took part in this evaluation. Acceptance of LEEM was assessed using the TAM3 [Venkatesh and Bala 2008] and three indicators: Ease of Use, Perceived Usefulness, and Intention to Use in the Future. Through the results of the Ease of Use indicator, it was possible to take into account the different preferences and learning experiences of learners in a real context, and still have a satisfactory result.

The quantitative results of the TAM3 indicators showed that the majority of learners found LEEM easy and useful. We also observed the teacher's perception, in which she considered the LEEM model to be easy, and useful and that she intends to use it in the future. The results of the qualitative analysis showed positive, negative, and neutral comments about the use of the LEEM model from the learners and the teacher. Positive comments included that LEEM was considered intuitive, easy, and quick to use. On the other hand, some learners found it difficult because the LEEM model seemed generalized. However, it was decided not to delimit the type of educational activity or the type of DICT for the use of the LEEM model, so that it can be used in different scenarios and contexts.

Some limitations were considered for this study. One of the limitations considered may have been the noise in the classroom where the LEEM model was being used. Another limitation is associated with interruptions by colleagues themselves during the use of the LEEM model. Finally, another limitation is the veracity of the information because, as with any type of evaluation carried out with learners and teachers, the reliability and veracity of the information obtained depends directly on who is answering. Therefore, based on these limitations, it is considered that these results present indications about the use of the LEEM model in a real context. In future work, we intend to carry out a case study with other classes of learners to use and evaluate the acceptance of the LEEM model.

Acknowledgments

References

Camilleri, V., de Freitas, S., Montebello, M., and McDonagh-Smith, P. (2013). A case study inside virtual worlds: Use of analytics for immersive spaces. In *Proceedings of the Third International Conference on Learning Analytics and Knowledge*, LAK '13, page 230–234, New York, NY, USA. Association for Computing Machinery.

Corbin, J. et al. (1990). Basics of qualitative research grounded theory procedures and techniques.

Correa, C. M., de Freitas, G. V. M., dos Santos Eberhardt, A. L., and Silveira, M. S. (2021). From now on: Experiences from user-based research in remote settings. In *Proceedings of the XX Brazilian Symposium on Human Factors in Computing Systems*, IHC '21, New York, NY, USA. Association for Computing Machinery.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3):319–340.

Dos Santos, G. C., Dos S. Silva, D. E., and C. Valentim, N. M. (2023). Proposal and preliminary evaluation of a learner experience evaluation model in information systems. In *Proceedings of the XIX Brazilian Symposium on Information Systems*, SBSI '23, page 308–316, New York, NY, USA. Association for Computing Machinery.

Huang, R., Spector, J. M., and Yang, J. (2019). *Educational Technology a Primer for the 21st Century*. Springer.

ISO9241-210 (2019). Ergonomics of human-system interaction — part 210: Human-centred design for interactive systems. [Online; acessado em 23/02/2022].

Kawano, A., Motoyama, Y., and Aoyama, M. (2019). A lx (learner experience)-based evaluation method of the education and training programs for professional software engineers. In *Proceedings of the 2019 7th International Conference on Information and Education Technology*, ICIET 2019, page 151–159, New York, NY, USA. Association for Computing Machinery.

Lang, P. (1980). Behavioral treatment and bio-behavioral assessment: Computer applications. *Technology in mental health care delivery systems*, pages 119–137.

Martinelli, S. R. and Zaina, L. A. M. (2021). Learning hci from a virtual flipped classroom: Improving the students' experience in times of covid-19. In *Proceedings of the XX Brazilian Symposium on Human Factors in Computing Systems*, IHC '21, New York, NY, USA. Association for Computing Machinery.

Moody, D. L. (2003). The method evaluation model: a theoretical model for validating information systems design methods.

Najib, M. and Fahma, F. (2020). Investigating the adoption of digital payment system through an extended technology acceptance model: An insight from the indonesian small and medium enterprises. *International Journal on Advanced Science, Engineering and Information Technology*, 10(4):1702–1708.

Ruiz, J. and Snoeck, M. (2018). Adapting kirkpatrick's evaluation model to technology enhanced learning. In *MODELS '18: ACM/IEEE 21th International Conference on Model Driven Engineering Languages and Systems*, MODELS '18, page 135–142, New York, NY, USA. Association for Computing Machinery.

Schmidt, M. and Huang, R. (2022). Defining learning experience design: Voices from the field of learning design & technology. *TechTrends*, 66(2):141–158.

Soloway, E., Guzdial, M., and Hay, K. E. (1994). Learner-centered design: The challenge for hci in the 21st century. *Interactions*, 1(2):36–48.

Venkatesh, V. and Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision sciences*, 39(2):273–315.

Wazlawick, R. (2019). *Engenharia de software: conceitos e práticas*, volume 2. Elsevier Editora Ltda., Rio de Janeiro.

Yeh, S.-W. and Chen, C.-T. (2019). Efl learners' peer negotiations and attitudes in mobile-assisted collaborative writing. *Language Education & Assessment*, 2(1):41–56.