UNIVERSIDADE ESTADUAL DE LONDRINA

MARIA PAULA PEREIRA DE LIMA

TEACH TECH: A FORMATIVE DIDACTIC EXPERIMENT ON TECHNOLOGY, DIGITAL LITERACY & ENGLISH LANGUAGE TEACHING

Londrina
2022

UNIVERSIDADE ESTADUAL DE LONDRINA

CENTRO DE EDUCAÇÃO, COMUNICAÇÃO E ARTES
DEPARTAMENTO DE EDUCAÇÃO

PROGRAMA DE PÓS-GRADUAÇÃO EM EDUCAÇÃO

Londrina
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Londrina, _____de _____de _____.

To the three father figures I will always cherish in my heart: my Heavenly Father, who's always been looking out for me from Heaven, and the two who moved there while I was working on this research: my father, João, and my godfather, Walter.
I love all three of you, forever.

ACKNOWLEDGEMENTS

There's an old African proverb which says, "it takes a village to raise a child". This famous proverb can easily be adapted to "it takes a village to write a dissertation[1]" without losing its meaning or being any less truthful. It really does, and I was blessed enough to have the very best villa with me on this journey. Here, I want to thank some of the people who were a part of it, at the risk of being unfair to someone. Please forgive me if that happens.

First and foremost, I want to thank my Heavenly Father, God, our Lord Jesus Christ, and his Holy Spirit. Without these three I would not even have survived these two years, let alone finished this dissertation.

Next, I want to thank my beloved grandmother, Leda Farias Leite, who gave me the opportunity to study English throughout my childhood. I never could have imagined what a huge role this language would come to play in my life, but it probably wouldn't have if it were not for her. Thank you, grandma! I love you!

To my best friend in the whole world, Maria Estela Leite Pereira de Lima, who also happens to be my mom. I could not have done this without the unconditional patience and support she's given me. These two years were quite turbulent, and the fact that she somehow found the straight to do that amidst everything she was going through is nothing short of extraordinary. In my dictionary, she will always be a perfect synonym to the words resilience and strength. Thank you, mom! I love you!

Speaking of unconditional patience and support, thanking my incredible supervisor, Dr. Michele Salles El Kadri, is very difficult because I'm not sure there is a proper word to describe just how vital she was to this process. I could not have done this without her, as literal as those words can be. She believed in me even before I was officially her supervisee, and she's been by my side every step of the way since. Besides being my supervisor, she quickly became a teacher, a friend, and a role model. Whenever I made a mistake – and trust me, there were a few of those – she never judged me nor made me feel worst. Instead, she pulled me to my feet and helped me fix it in any way she could, to which I will forever be grateful. I can confidently say

[1] The word "dissertation" is used to describe this work because it required an oral defense.

that I am better today because of her. These two words seem way too simplistic to express all of my gratitude, but thank you, professor!

To another incredible professor, Dr. Denise Ismênia Bossa Grassano Ortenzi, who embarked in this journey with me and Michele and supported this research from day one. Thank you so much for your dedication, patience and encouragement, professor!

I would also like to thank all of the amazing professors from PPEdu (Portuguese abbreviation that corresponds to the University of Londrina Graduate School of Education Program), all of my colleagues from LIDEP (our research group) and CAPES for sponsoring this research.

Last but certainly not least, I would like to thank my families: the one I'm connected to by blood and the one I found through my faith. I love both of them deeply and am forever thankful I could lean on their love and prayers to go through this huge challenge. I will not mention individual names, for I do not want to risk forgetting anyone, but you know who you are, and you are all amazing!

LIMA, Maria Paula Pereira de. **TEACH TECH: A FORMATIVE DIDACTIC EXPERIMENT ON TECHNOLOGY, DIGITAL LITERACY & LANGUAGE TEACHING**. 2022. 153p. Dissertação (Mestrado em Educação) – Universidade Estadual de Londrina, Londrina, 2022.

RESUMO

A pandemia da Covid-19, causada pelo vírus Sars-Cov-2 e suas subsequentes variantes fizeram com que as atividades educacionais migrassem repentinamente para um modo emergencial remoto (HODGES et. al, 2020). Inserido neste contexto, neste trabalho objetivamos apresentar um Experimento Didático Formativo (SFORNI, 2015) elaborado para ensinar professores de língua inglesa em formação a respeito de tecnologia durante o período de ensino remoto emergencial, causado pela pandemia da Covid-19, através do desenvolvimento de um revista digital. Objetivamos também investigar e analisar seu potencial como metodologia e ferramenta de organização de aulas para promoção de oportunidades de aprendizagem e desenvolvimento dos referidos professores em formação. Além disso, buscamos investigar se há evidências de desenvolvimento de Letramento Digital nos dados coletados. Os dados foram coletados por meio de gravações de aulas online via Google Meet e atividades também online postadas em sala de aula online, via Google Classroom. A análise dos dados se dá com base na literatura (EL KADRI, 2014; VYGOTSKY, 1997; GERMANOS, 2018; VYGOTSKY, 1978; SANGER; CASSANDRE, 2019; VYGOTSKY, 1994; LEONTIEV, 2005; SFORNI, 2015; MARTIN & GRUDZIECKI, 2006), aula por aula, explicando o objetivo principal e quais princípios sugeridos (SFORNI, 2015) estávamos tentando implementar. Em seguida, transcrições e gravações das aulas são apresentadas e analisadas em busca de evidências de desenvolvimento do conceito de Tecnologia e Letramento Digital. Finalmente, as possibilidades e limitações do Experimento Didático Formativo (EDF) são discutidas. Os resultados indicam que há indícios que apontam para o desenvolvimento do conceito de Tecnologia e de Letramento Digital nos professores em formação participantes. Os resultados também apontam para o potencial do EDF não somente como metodologia de pesquisa, mas também como ferramenta para organização de um ensino com potencial para promoção de aprendizagem e desenvolvimento.

Palavras-chave: Experimento Didático Formativo. Formação de Professores. Tecnologia. Ensino Emergencial Remoto.

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ABSTRACT

The Covid-19 pandemic, a global catastrophe caused by the virus Sars-Cov-2 (and its subsequent variants) caused educational activities to suddenly shift into an emergency remote learning mode (HODGES et. al, 2020). In this context, this research aims to present a Formative Didactic Experiment (SFORNI, 2015) which was designed to teach pre-service English teachers about technology through the development of a digital magazine during the period of emergency remote teaching caused by the Covid-19 pandemic, as well as to investigate and analyze its potential as a methodology and tool to organize classes so as to enhance the opportunities for learning and development of said pre-service teachers. In addition, we seek to investigate whether there is evidence of Digital Literacy development in the data collected. Data was gathered through the recordings of each online meeting via Google Meet and through activities posted online as well on the Google Classroom online platform. Data analysis is based on the literature (EL KADRI, 2014; VYGOTSKY, 1997; GERMANOS, 2018; VYGOTSKY, 1978; SANGER; CASSANDRE, 2019; VYGOTSKY, 1994; LEONTIEV, 2005; SFORNI, 2015; MARTIN & GRUDZIECKI, 2006)), class by class, explaining the main objective of each class and which of the suggested principles (SFORNI, 2015), trying to implement. Transcripts and recordings of classes are then presented and analyzed for evidence of development of the concept of Technology and of Digital Literacy. Finally, the limitations and limitations of Formative Didactic Experiment (FDE) are discussed. The results seem to indicate that there is evidence to suggest the development of the concept of Technology and Digital Literacy by the pre-service teachers who participated, but a longer timeframe would be necessary for this to be affirmed with certainty. The results also point to the potential of FDE not only as a research methodology, but also as a tool for organizing teaching with the potential to promote learning and development.

Key-words: Formative Didactic Experiment. Teacher Education. Technology. Emergency Remote Learning.

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LIST OF ABBREVIATIONS AND ACHRONYMS

FDE	Formative Didactic Experiment
ZPD	Zone of Proximal Development[2]
CPC	Preliminary Course Evaluation[3]
ENADE	National High School Exam[4]
CEP	Research Ethics Committees[5]
CONEP	National Research Ethics Committee[6]

[2] Zona de Desenvolvimento Proximal

[3] Conceito Preliminar de Curso.

[4] Exame Nacional do Ensino Médio.

[5] Comitês de Ética em Pesquisa.

[6] Comitê Nacional de Ética em Pesquisa.

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1 INTRODUCTION

According to Vygotsky (1998), the correct way of organizing the learning process is the one which leads students to develop their minds, that is, their higher mental functions. Sforni (2004) agrees with the author, stating that simply having access to knowledge at school and attending it frequently is not enough – it is necessary that students be exposed to what she refers to as an "adequate learning situation" (SFORNI, 2004, p. 3). In other words, the way in which the learning process – and, automatically, the teaching process as well - is organized may enhance or diminish the potential for learning and for the development of students' higher mental functions.

However, the process of translating these theoretical concepts into practical actions for the classroom varies depending on the educator's beliefs, but it is clear that it is not easy. Regardless of the didactic studies related to such process, it is one teachers struggle with (SFORNI, 2004). I am no exception to this, as I have struggled with this process myself several times when sitting before a mostly blank lesson plan, trying to figure out which activities and procedures would lead students to achieve the learning goals I had listed at the top of the page.

These difficulties were only aggravated by the Covid-19 pandemic, a global catastrophe caused by the virus Sars-Cov-2 (and its subsequent variants) that, as I[7] write this introduction, has killed over five hundred thousand Brazilians and more than four million people worldwide. It also aggravated all kinds of social issues, bringing new challenges or hardening existing ones in all areas of life, including education.

Local authorities imposed the necessary safety measures to try and prevent – or at least slow down – the spread of the coronavirus, which included social distancing. These meant classes as we knew them – teachers and students sharing a classroom in person at school – were no longer a possibility. Consequently, teachers everywhere – including two who participate in this research – needed to suddenly shift

[7] During this dissertation, the pronoun "I" is used along the sections that are specific to this work and "we" along the sections in which the work was done collaboratively (methodology and analysis).

into an emergency remote learning[8] and teaching mode, having to adapt their classes to a 100% online environment without much time to figure out how to do that.

Thus, this research aims not only to present the Formative Didactic Experiment[9] we carried out for the development of digital literacy analyzed through the principles of the FDE, by the researcher's perspective, but also to demonstrate whether there are evidence of digital literacy development. At the same time, we wanted to verify the potential of the FDE as a methodology and tool to organize and enhance the opportunities for learning and development of said pre-service teachers.

The chart below summarizes the general and objective goals of this study, as well as the research questions that were drown based on the aforementioned goals.

Chart 1 - Main goal, specific goals and research questions

Main Goal	Present a Formative Didactic Experiment designed to teach pre-service English teachers about Technology & Digital Literacy during emergency remote teaching, as well as to investigate and analyze its potential as a methodology and tool to organize and enhance the opportunities for the development of digital literacy concept in said pre-service English teachers.
Specific Goals	I. Present a Formative Didactic Experiment, by the researcher's perspective, through the principles of FDE; II. Identify whether there is evidence of the development of the (scientific) concept of digital literacy within the Language Teaching field;
Research Questions	I. How was the FDE organized? II. Is there evidence of the development of the concept digital literacy in the data collected? III. What are the potentials and limitations of the formative didactic experiment in this process?

Source: the author.

[8] I adopt the definition of emergency remote learning provided by Hodges et al. (2020), which follows: "In contrast to experiences that are planned from the beginning and designed to be online, emergency remote teaching (ERT) is a temporary shift of instructional delivery to an alternate delivery mode due to crisis circumstances. It involves the use of fully remote teaching solutions for instruction or education that would otherwise be delivered face-to-face or as blended or hybrid courses and that will return to that format once the crisis or emergency has abated".

[9] It is important to notice that in this chapter, our focus is to present the actual Formative Didactic Experiment produced, that is, the result of our discussions, and not how they were designed. The process of how what we present here was produced is the focus of Silvia's work (2022).

In order to achieve these goals, in this dissertation, I bring the data gathered from online classes recordings (via Google Meet) as well as activities registered to an online classroom platform (Google Classroom) during the elective course I carried out my internship, entitled “Technologies, Digital Literacy and Language Teaching”, which was offered to pre-service English teachers on the final two years of their undergraduate degree.

Several reasons led me to conduct this research. Personally, I have been both a student and a teacher of the English language, and the role technology played in both my learning and teaching processes has been constantly growing over the last few years.

As an undergraduate student, apart from studying it in class as part of the syllabus for many of our courses, I also joined a research project[10] that investigated the use of technological tools during English classes in Brazil and tried to implement some of that knowledge during my mandatory teaching practicum. That experience taught me that it is in fact very difficult to articulate theory and practice when the goal is to develop higher mental functions, especially when technology and its tools are factored into the equation, and structuring all of that into a class can also be quite complicated. However, it also taught me that it is not impossible. While I do not believe that technology will ever completely replace teachers, I do believe there is a place for it in education.

Saviani (2003) points out that teachers are responsible to organize classes in such a way that the syllabus, its contents, and the way students will learn them provides maximum opportunities for development and learning for students. In agreement with the author, Sforni (2004, p. 4) states that[11] “[...] teaching that promotes development implies analyzing the quality of school content and the way in which it is appropriated by the student. These two aspects, in unity, bring guiding elements for the organization of teaching”. As a master’s degree student in the field of education, I am working towards achieving a degree that will allow me to teach and prepare future teachers for these very challenges, which compels me to try and find at least possible answers to them.

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[10] TECNOLOGY AND DIGITAL LITERACIES IN TEACHER EDUCATION AND LANGUAGE TEACHING; Denise Ismenia Bossa Grassano Ortenzi - Coordinator / Michele Salles El Kadri - Member.

[11] Originally: “[...] pensar em um ensino promotor do desenvolvimento implica em analisar a qualidade do conteúdo escolar e o modo de sua apropriação pelo aluno. Estes dois aspectos, em unidade, trazem elementos orientadores para a organização do ensino” (SFORNI, 2004, p. 4)

Furthermore, I had to develop my supervised undergraduate teaching internship during the Covid-19 pandemic, which meant the entire internship happened remotely, with classes happening 100% online. This experience only fueled the need to better understand the role of technology in education, especially in this unusual, emergency remote learning context.

Having as its core the use of technology in education, specifically in English classes, this research is also fitting to the historical moment in which it happens. The 21st Century Skills Map, which was created by P21, the 21st Century Learning Partnership (formerly the 21st Century Skills Partnership), identified digital and mediatic literacy as essential skills for 21st century education. It is important that students are able to understand how the media reflects language and culture, so that they can identify and evaluate authentic sources of information (P21, 2011).

This poses a direct contribution to society in general: the more digitally literate teachers become, the better they can develop their students' digital and mediatic literacies, which points towards the construction of a society that is able to distinguish facts from fake news and make decisions and/or form opinions accordingly. Also, as previously mentioned, teacher education is a core topic of this research, one I hope to contribute to, so the study of technology in education and digital literacy connected to teacher education is extremely relevant.

Although the Skills Map for the 21st Century focuses on the American educational context, the concepts presented in it can be extended to the Brazilian field, as stated above, new technologies have entered Brazilian and global education quickly.

This document represents the existence of a consensus around the fact that, in an increasingly globalized and digital century, it is essential that education provides a new and adapted set of skills, which also involve technology (and the current Covid-19 pandemic further emphasized this need). However, there is no consensus as to what skills and specific knowledge are needed for digital literacy to occur (OSTERMAN, 2013). Despite advances in research and teacher education in this field, there is still a lot to be developed on that front.

Again, the main goal of this study is to present a Formative Didactic designed to teach pre-service English teachers about Technology & Digital Literacy during an emergency remote teaching context and to investigate and analyze its potential as a methodology and tool to organize and enhance the opportunities for the

development of digital literacy concept. This FDE was carried out during my graduate teaching internship, and I performed it alongside two professors in the field of Teacher Education, who were mainly responsible for the course, and a fellow researcher.

We worked together in a co-planning and co-teaching process[12] from the very beginning, when we were putting the course together, until the end, when we graded and reflected upon the pre-service teachers' work and development.

We chose the Formative Didactic Experiment (mainly based on Sforni, 2015) precisely because we believed it would be a suitable tool for the challenge we were faced with: transferring and adapting the classes, contents, and assignments of the course to a 100% online scenario and we were all worried if we were going to be able to organize the teaching in a way that it could foster learning and development.[13]

The principles brought forth by Sforni (2015) as well as the suggested teaching actions seemed to us like an interesting framework to shift into the emergency remote learning and teaching situation we were facing whilst making sure that we did so in a way that provided as many learning and development opportunities as possible, keeping students at the center of the process and making sure they were active during the knowledge building journey.

It also seemed to be a fitting methodological tool to structure my research, since, as a research tool, the FDE understands the role of the researcher as an active rather than observant one. When it comes to classroom research, it translates into having the researcher work alongside or as the teacher(s) themselves, which is exactly what my internship would require of me.

The upcoming contents of this dissertation are organized thusly: first, I will explain the theoretical foundation upon which this research is sustained, that is, the social-cultural-historical perspective of learning and development (EL KADRI, 2014; VYGOTSKY, 1997; GERMANOS, 2018; VYGOTSKY, 1978; SANGER; CASSANDRE, 2019; VYGOTSKY, 1994; LEONTIEV, 2005) as well as the Formative Didactic Experiment (SFORNI, 2015; LEONTIEV, 1983) and the definition of Digital Literacy it adopts (MARTIN & GRUDZIECKI, 2006) . Next, I will describe the

[12] Co-teaching can be defined as a partnership between two or more teachers who work together to teach, create content and overall share knowledge (EL KADRI, 2014). Co-planning is an aspect of that process, and it refers specifically to lesson planning.

[13] The term "transfer the course" is used here because during the planning stage, we had to adapt the syllabus (which was all we had of the course up until that moment) to the remote learning mode.

methodological approach chosen for this study, which is also the Formative Didactic Experiment (SFORNI, 2015; LEONTIEV, 1983), as well as detail the context in which it was carried out and what was the criteria chosen for analysis. Finally, I will proceed with the results of the analysis and the conclusions reached through it.

2 THEORETICAL FRAMEWORK

I start this chapter presenting the Social-Historical-Cultural Perspective of Learning and Development, detailing its core principles, and differentiating between the two processes (learning and development). Next, I explain the Formative Didactic Experiment and the principles and teacher actions that guided the FDE carried out for this research. I end this chapter bringing the perspective of Digital Literacy I choose to guide this dissertation.

2.1 SOCIAL-HISTORICAL-CULTURAL PERSPECTIVE OF LEARNING & DEVELOPMENT

There are a few different terms which define different social-cultural perspectives and approaches to learning (EL KADRI, 2014). On this dissertation, I adopt the same term chosen by El Kadri (2014), “social-historical-cultural” perspective for learning and teaching, as this work will also focus on “ […] (a) the relations of teachers in initial and continuous education and the social practices as key to understanding their development in/through this transformative experience and (b) the relationship between human consciousness and practical activity.” (EL KADRI, 2014, p. 40).

When it comes to teacher education, and in fact, traditional psychology in general, there is a tendency to look at professional development as an isolated activity, separate from everything else that occurs in a person’s life – an educator in this case (GERMANOS, 2018). However, the social-historical-cultural perspective proposes a more wholesome analysis of the individual, understanding that any and every activity in which one engages, regardless of its nature (cultural, social, leisure etc.), affects all other areas of their life, including the professional one (GERMANOS, 2018).

Furthermore, according to Vygotsky (1997) human’s personalities as well as all of our higher mental functions are developed through social relations and social interactions, so it is impossible to think of any kind of development as an isolated process.

Therefore, the social-historical-cultural perspective understands that the development of higher-level cognition in human beings happens through social life, during a dynamic process of engagement between the individual and the world around

them. It is through social interchange that the appropriation of pre-existing cultural tools happens, and this process shapes how people think and, consequently, who they become. In other words, it is impossible to separate cognitive development from the historical, social, and institutional situations in which it is inserted (ELLIS; EDWARDS; SMAGORINSKY, 2010).

That being said, the line between the concepts of learning and development does seem a little foggy. Vygotsky (1978) points out that there are three main theories which aim at explaining the relationship between learning and development – all of which he himself will come to reject.

The first theory, according to the author, claims that development is independent from learning, that is, development happens regardless of learning. Taking a child as an example, according to this theory, development would be a pre-requisite of learning, meaning, a child can only learn after he or she has developed into a certain age.

The second theory treats both concepts as synonyms. Here it is assumed that any kind of development is intertwined with learning, and the two overlap each other. Going back to the example of the child, age is no longer a pre-requisite for learning, but at each stage of life, the child's learning and development process happen hand in hand, propelling he/she o their next stage in life and so on.

The third theory is a mix of the previous two, and it understands development in two different ways: for one, development happens regardless of learning, as a process of its own (such as the development of the cognitive system, for example) and as complementary one to the learning process.

As mentioned before, however, Vygotsky rejects all three theories, and instead proposes yet another way of understanding the relationship between learning and development, creating the concept of the Zone of Proximal Development (ZPD).

In his own words, the Zone of Proximal Development is

> "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem-solving under adult guidance, or in collaboration with more capable peers" (VYGOTSKY, 1978, p. 86).

The "actual developmental level" refers to how much of someone's higher mental functions have already been developed thus far, that is, mental development is observed and assessed in retrospect. The "level of potential

development", which is identifiable via the ZPD, refers to the potential for mental development, that is, what can be achieved with guidance of an adult or a more capable peer (re-enforcing Vygotsky's understanding of learning as a social activity).

In other words, through the Zone of Proximal Development it becomes possible to identify which and how much of one's higher mental functions have already been developed and how much further that development can go. The level of potential development identified in an individual today will likely become his/hers actual developmental level tomorrow, in a continuous and dynamic process (SANGER; CASSANDRE, 2018). This is the basis of the Formative Didactic Experiment (and of this research): the goal is to organize and plan the activities and assignments (teaching, in general) so as to foster this dynamic process, always having the next level of development as a goal.[14]

As a result, Vygotsky concludes that learning and development are not the same. In fact, the author understands these two concepts to be quite different, even though they are still connected.

According to him (VYGOTSKY, 1994) learning is a form of continuous improvement, also referred to as quantitative changes or incremental changes (GERMANOS, 2018), such as acquiring new technical skills or perfecting existing ones. Development, on the other hand, refers to a revolutionary breakthrough, a qualitative change in one's way of doing or understanding something – a profound shift that leads to the reorganization of one's consciousness (GERMANOS, 2018).

As different as they are, these two processes are still connected because once there is a qualitative change, that is, once development happens, the learning process is also altered into a different path. Basically, "[...] the learning process does not overlap with the development process, since development comes after learning, in a much slower fashion. That means that one will culminate on the other." (SANGER; CASSANDRE, 2019, p. 6)[15].

[14] This process also turned into a formative experience for myself and the other three people who were working with me. However, this study focuses on the formative experience o four pre-service teachers. A detailed look at our formative experiences while organizing and producing this course is the main subject of Siliva Calazan's work (CALAZANS, 2022, to be published).

[15] Originally: "[...] o processo de aprendizagem não coincide com o processo de desenvolvimento, uma vez que o desenvolvimento progride de forma lenta e atrás do aprendizado. Isso pressupõe que um seja convertido no outro." (SANGER; CASSANDRE, 2019, p. 6).

Exactly because development can be defined with such active verbs like shift, reorganization and change, another very important concept emerges, and it is referred to as agency.

Agency here is understood as “the capacity one demonstrates to act and take a stand before a certain situation, which could be mediated by objects or other human beings” (SANGER; CASSANDRE, 2019, p. 3).

This capacity is an important part of the development process. Since development can be defined with action verbs such as “change” and “reorganization”, the capacity human-beings have of breaking a certain pattern of action and taking the necessary initiatives to change it (SANGER; CASSANDRE, 2019) is vital for there to be true development. Once there is a shift in consciousness, and individual’s capacity for agency allows that shift to be translated into their actions, impacting, and changing their practice – that is when development happens.

As mentioned above, this process could be mediated by other human beings or objects. Vygotsky (1978 apud. SANGER; CASSANDRE, 2019) believed that cultural artifacts enhance the process of learning and development, and according to Cassandre et al. (2016), these cultural artifacts can be use collectively by a group of people who have a common transformational goal, and, therefore, are manifesting their agency together.

The activity in which this process occurs (development) is referred to as the “main activity”. The main activity is understood by Leontiev (2005) as having three main characteristics: it generates new and different types of activity, it develops or reorganizes one’s higher mental functions, and it is the main source of psychological changes at a certain point during the development process (GERMANOS, 2018).

This is an important differentiation because not every activity will lead to development – some will lead to learning only, that is, continuous and quantitative changes.

The main activity is that which leads to the reorganization of the individual(s) consciousness(es) and consequently to qualitative changes through the manifestation of their agency(ies) (LEONTIEV, 2005; GERMANOS, 2018; SANGER; CASSANDRE, 2019).

With these concepts in mind, educators everywhere may find themselves facing a pivotal question, one that is part of what compelled me to this carry this investigation: what would the main activity look like in our own day-to-day

classroom reality? Is there a framework we could use to translate these theoretical concepts into practice, so as to create classes that, at the very least, hold the potential to promote development in our students?

In the context of this research specifically, I found myself reflecting upon this issue not only because I was helping to structure a course for pre-service teachers, but also because I was doing so in during a pandemic, which meant, as previously mentioned, doing everything in a remote teaching and learning mode.

This is where the Formative Didactic Experiment appears as a possibility, one that is detailed in the following section.

2.1.1 Formative Didactic Experiment

Marta Sforni, in her 2015 article entitled “Interaction between Didactics and the Historical-Cultural Theory”[16] manifests her uneasiness with one particular sentence uttered by Vygotsky (1998, p. 115 apud. Sforni, 2015, p. 376) in which he affirms that “a correct organization of the child's learning leads to mental development”. Naturally, the term “correct” bothers the author, who then settles on a journey to figure out what would be this “correct way” of organizing the learning process.

With that goal in mind, she understands that, even though Vygotsky is not a didactics scholar, he is slightly leaning into the field when he affirms that the *organization* of the learning process can lead to development, which leads Sforni (2015, p. 376) to believe that linking didactics with the historical-cultural theory might be a promising path to find the “correct way” of organizing the pedagogical practice hinted by Vygotsky.

This investigation, which she conducted alongside her research group, led to a synthesis of didactic principles and teacher actions that are favorable to learning (SFORNI, 2015, p. 376). These didactic principles and teacher actions were the ones that my fellow researcher, the other two teacher educators and me followed when we were developing and structuring the course that served as both my graduate teaching internship as well as the source of data collection for this dissertation. We also followed the same methodology Sforni and her fellow researchers used to arrive to those principles, which is hereby referred to as Formative Didactic Experiment[17].

[16] Originally “Interações entre Didática e Teoria Histórico-Cultural” (SFORNI, 2015).
[17] Originally “Experimento Didático Formativo” (FREITAS, 2010)

The Formative Didactic Experiment elaborates on ideas put forward by Vygotsky (1993), Davidov (1988) and the historical-cultural perspective in general, creating a model that serves as both a tool/methodology for classroom research and class organization and planning (SFORNI, 2015).

As a research methodology[18], one of its main characteristics is that the researcher has an active role in the investigative process, rather than an observant one, either exercising the role of the teacher or working alongside them .

However, it also works as tool for class organization because it allows teachers to experiment with different ways of organizing learning, and to reflect upon the effects each different organization mode has on the students learning and developing processes, even if the educator in question isn't necessarily working on "formal/academic research", so to speak.

The five key principles listed by Sforni (2015) which she found to be favorable to learning and development as well as the practical teaching actions she suggests so that these principles can be met by teachers in their classes are listed and detailed below.

The first principle is entitled "teaching that promotes development". This principle consists of first identifying the potential developmental level of students and then organizing the learning process accordingly, having that as a main goal.

There are three practical teaching actions listed for this principle:

> "a) assessment of the actual level of development and prediction of the potential level of development;
> b) use of activities that mobilize the Higher Mental Functions;
> c) creation of situations in which students verbally express what and how they are thinking (how they are mentally acting with the concepts)." (SFORNI, 2015, p. 385)[19]

[18] The Formative Didactic Experiment as a research methodology will be further explained on a chapter dedicated to the methodological procedures of the research.

[19] Originally:

> "a) avaliação do nível de desenvolvimento atual e previsão do nível de desenvolvimento esperado;
> b) uso de atividades com os conceitos que mobilizam as Funções Psíquicas Superiores;
> c) criação de situações em que os estudantes expressem verbal- mente o que e como estão pensando (como estão atuando mentalmente com os conceitos)." (SFORNI, 2015, p. 385)

The second principle is that of “the active character of learning”. This principle hopes to avoid traditional methodologies of teaching, also known as teacher-centered. Instead, this principle puts students as active participants in the learning process.

It is important to notice, however, that the author is not advocating that students should do it all by themselves. The key word is collaboration: teacher(s) and student(s) working together to build knowledge and learn, exercising agency collectively.

The practical teaching actions for this principle are:

> “a) incorporation of problem-solving situations that allow the student to be inserted in the investigative horizon that first originated the concept;
> b) Planning moments for students to dialogue with each other and prepare collective summaries, even if they are not definite;
> c) guidance of the process of elaboration of conceptual summaries by students.” (Sforni, 2015, p. 387)[20]

The third principle refers to “the conscious character of the activity”. This principle determines that, for learning to happen, it is not enough for the content to be inserted in the activity - it must be the object of the students' mental actions.

Quoting Leontiev (1983), Sforni explains that students may perceive or understand a certain content, but never actually gain awareness of it, precisely because it is not always the object of students' mental actions; in other words, their attention tends to shift to another aspect of the activity, in which case learning does not take place. This is exactly what this principle hopes to avoid.

The practical teaching actions for this principle are:

> “a) elaboration of activities that have the potential to promote action with the concept;
> b) prediction of mental actions so that the central content of the activity is the focus of the students' conscience;

[20] Originally:

> “a) elaboração de situações problema que permitam inserir o estudante no horizonte investigativo que deu origem ao conceito;
> b) previsão de momentos em que os alunos dialoguem entre si e elaborem sínteses coletivas, mesmo que sejam provisórias;
> c) orientação do processo de elaboração de sínteses conceituais pelos estudantes.” (Sforni, 2015, p. 387).

> c) attention to the students' verbal explanations, which indicate whether they are establishing a relationship between the particular and the general." (SFORNI, 2015, p. 389)[21]

The fourth principle is entitled "the unity between the material and verbal spheres". This principle highlights the importance of verbal language, whether spoken or written, in the learning process, pointing to it as a mediator between the material and mental level. This mediation is essential, according to the author (SFORNI, 2015), as it can bring awareness to the learning process, demonstrate what is essential and bring the focus to the concepts contained in the activities.

The author also states that the reading of scientific texts of the area also fits this principle, and it is essential that the conclusions reached by the group after discussing these texts and ideas be further developed. The goal is to expand them so that students become familiar with the use of language to that specific area of knowledge (SFORNI, 2015).

The practical teaching actions for this principle are:

> "a) organization of activities that promote interaction between the material or materialized level (illustrative) and verbal language (spoken and written).
> b) use of scientific and classic texts from the respective field of knowledge." (SFORNI, 2015, p. 390).[22]

The fifth principle is entitled "action mediated through concept", and it establishes that the concept must be presented and contextualized to students through activities and school tasks that lead them to understand the concept as a symbolic

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[21] Originally:

> "a) elaboração de atividades que tenham potencial para promover o modo de ação geral com o conceito;
> b) previsão de ações mentais para que o conteúdo central da atividade seja o foco da consciência dos estudantes;
> c) atenção para as explicitações verbais dos estudantes, as quais sinalizam se eles estão estabelecendo relação entre o particular e o geral." (Sforni, 2015, p. 389)

[22] Originally:

> "a) organização de atividades que coloquem em interação o plano material ou materializado (ilustrativo) e a linguagem verbal (oral e escrita);
> b) uso de textos científicos e clássicos da respectiva área de conhecimento." (Sforni, 2015, p. 390)

instrument of the interaction of man with the environment, and as a solution to its needs (SFORNI, 2015).

In other words, the concept should not be presented in an expository or historical way only, but the teacher should develop activities mediated by the concepts to be worked on, so that students actively interact with them.

The practical teaching actions for this principle are:

> "a) Analysis of the genesis of the concept in its logical-historical aspect to seek what is the core of the concept
> b) Elaboration of problem-solving situations, which require students to mediate the concept
> c) Inclusion of new learning problems at the end of the study process to analyze whether students operate mentally with the concepts" (SFORNI, 2015, p. 392).[23]

As shown in this literature review, Sforni's (2015) principles aim at organizing teaching and learning so as to promote as many opportunities for conceptual learning and development as possible. In the case of this research, the main concept aimed to be developed was the Digital Literacy concept. I now present a discussion on Digital Literacy.

2.1.1.1 Digital literacy

The meaning of the broader term "Literacy" was first established in Brazil in the late 90's, with national scholars pointing out the difference between "alphabetization" and "literacy" for the first time. The society we live in is highly literate, in the sense that its culture is centered around the many possible forms of writing - books, papers, documents, notes, etc (BORGES, 2016). In Soares' words, being literate refers to the "state or condition of individuals or social groups in literate societies

[23] Originally:

> "a) análise da gênese do conceito no seu aspecto lógico-histórico para buscar o que é nuclear no conceito;
> b) elaboração de problemas desencadeadores com a finalidade de levar os alunos a resolvê-los por meio da mediação do conceito;
> c) inclusão de novos problemas de aprendizagem ao final do processo de estudo para analisar se os alunos operam mentalmente com o conceito." (SFORNI, 2015, p. 392)

that effectively participate in social practices of reading and writing, competently taking part in literacy events" (SOARES apud. BORGES, 2016, p. 704).

From that perspective, it is possible to conclude that if one does not effectively dominate social practices of reading and writing, one will most certainly find difficulties identifying with and actually being a part of that society, as there is no way to truly belong to it without dominating its language practices. (SOARES, 1998; GOODY, 2006).

However, as also explained by Soares (1998), being literate goes beyond being alphabetized. Simply learning the language is not enough, since it is used in diverse social situation and their corresponding activities and practices, which also require different skills.

On the same line of thought, Buzato explains that being literate involves

> "participation in a set of social practices in which meaning and sense of certain culturally encoded contents (traditionally, but not exclusively, written texts) are generated, disputed, negotiated and transformed." (BUZATO apud. BORGES, 2016, p. 704).

Typically, these processes of negotiation and transformation mostly happen through traditional reading and writing practices, such as those held in school and around the society in general.

However, the more post-modern our society becomes (BORGES, 2016), that is, with each new technological development and/or innovation, the line that separates real from virtual becomes finer.

This scenario is what Lemos (2003) refers to as "cyberculture". The author points out that technological devices are an ever-growing feature of everyday life ever since telecommunications and computing started to blend into the same thing in the 70s. The virtual and real spheres are not so different anymore, but more so complementary to one another; consequently, the way society interacts with both completely changes. In other words, this new digital environment requires a different, more specific set of skills, which justifies the use of the also specific term "digital literacy" as opposed to assuming that this concept would be included in the broader term "literacy" (COSCARELLI, 2020; BORGES, 2016;).

But what exactly can be understood as "digital literacy"? On the following paragraphs, we present a brief literature review featuring the main definitions

and understandings put forward by international and national scholars on the term, and then point which one we adopted for this research and why.

Borges (2016) compiled and organized a literature review of the main concepts and definitions of “digital literacy” according to international and national mainstream scholars, which we will briefly revisit in this section.

In the international scenario, the definition of the term digital literacy was first introduced in the academy by Paul Glister (1997), who defined it as “an ability to understand and to use information from a variety of digital sources” (BAWDEN, 2008, p. 18). As previously mentioned, with the development of cyberculture and its pacts in all areas of society, including education, the term quickly became an object of study to many different scholars and research groups around the globe.

The theoretical framework in which each group or scholar based themselves to study it though varied greatly, so in this research we agree with Borges (2016) and revisit those who approached it from a multiliteracies perspective.

The north-American study group led by Knobel e Lankshear understand digital literacy as a concept which represents a set of different social practices and skills, which englobe cognitive, social, and emotional aspects of activities in the digital environment. Being digitally literate, in this case, involves effectively participating in such social practices and developing these skills, which will allow individuals to understand, for example, new forms of textual genres that are specific to that environment, such as memes, for instance (LANKSHEAR E KNOBEL, 2008).

Borges (2016) also points out that the concept of digital literacy has also been studied by institutions that are not typically academic, such as the international panel organized by ETS (Educational Testing Services), which gathered education specialists from all over the globe to reflect on the growing impact of communication technologies in the traditional definition of “literacy”. The result was a report published in 2007, entitled Digital Transformation, which, on the same perspective of previously mentioned authors, understands that being digitally literate englobes both technical and cognitive skills, meaning that it might involve effectively performing simple, daily technological tasks to more complex and specific ones.

We would also like to highlight the more recent document 21st Century Skills Map. This document is the result of The Partnership for 21st Century Skills (P21), which gathered key educational organizations in the United States to reflect and “illustrate the intersection between core subjects and 21st Century Skills.” (P21, p. 1).

After a year of work, according to the authors, the map “reflects the collective effort of hundreds of World Language teachers and illustrates the integration of World Languages and 21st Century Skills.” (P21, p. 1). Two of the skills pointed out as essential in this integration were Media and Technology Literacy, both of which can be connected to Digital Literacy, emphasizing the multiliteracies perspective.

Expanding on that notion, Eshet-Alakalai (2004) understands Digital Literacy as a conglomerate of other types of literacy, such as media and technology but also information literacy, social-emotional literacy etc. As Borges (2016) explains, the author points out that “users perform with tasks that require the utilization of different types of digital skills” (ESHET-ALAKALAI, 2004, p. 94 apud. BORGES, 2016).

Some authors have devoted their studies to identifying and creating roadmaps for the development of some digital literacy skills which they considered imperative, such as Ward e Karet (1996), who pointed out the following:

> “These are: proficiently use, configure, manage, select options, among others, mechanisms as the e-mail, the internet browser, use codes to build pages, ability to link contents, attach images, use communication tools live, log into other servers, access files, using FTP (File Transfer Protocol) and use USENET newsgroups9 and bulletin boards.” (BORGES, 2016, p. 715)[24]

In Brazil, as previously mentioned, the topic was first approached in the late 90’s and early 20s. Soares (2002) points out that this was a time when the Brazilian society was being introduced to the latest developments in digital communications technology. These developments created new forms of social practice, which involved reading and writing through digital technologies. Consequently, these developments had a different impact in society then that of reading and writing social practices on paper, so the author understands that the concept of digital literacy must be separated from that of literacy (SOARES, 2002.)

Coscarelli (2020) points out that on top of the set of skills required, the digital environment incubates the development of new types of textual genres that are

[24] Originally:

> “São elas: usar com proficiência, configurar, gerenciar, selecionar opções, entre outros, mecanismos com o e-mail, o browser da internet, usar códigos para a construção de páginas, habilidade de linkar8 conteúdos, anexar imagens, usar ferramentas de comunicação em tempo real, entrar em outros servidores, acessar arquivos, usando o FTP (File Transfer Protocol) e usar o USENET newsgroups9 e bulletin boards (BORGES, 2016, p. 715)”

specific to it, such as memes, for example, and it fosters new types of social activity, such as digital publications, (COSCARELLI, 2020) like the digital magazine issue proposed on the course this study analyses. To her as well as Ribeiro (2007), digital literacy would be a branch of the broader term literacy but in a different – digital – environment.

Another pioneering definition was the one put forward by A. C. Xavier (2007), who understood digital literacy as a set of skills (including new forms of reading and writing) which are directly connected to social participation (BORGES, 2016). The author understands that, in this scenario, the definition of reading and writing practices is broadened, not only because they now happen through tech devices and digital platforms, but also because they include both verbal and non-verbal codes (BORGES, 2016).

Buzato (2006) agrees with the author, defining digital literacy, as previously mentioned, as a set of social practices that are intertwined with one another and happen through digital devices. These interactions can happen in person (with the aforementioned digital devices) or be exclusively electronic.

Souza (2007) agrees with Buzato, providing his own definition of digital literacy as

> “the set of skills necessary for an individual to understand and use information critically and strategically, in multiple formats, coming from different sources and presented through the computer, in a critical and strategic way, being able to achieve their goals, which are often socially and culturally shared.” (SOUZA, 2007, p. 60)

Finally, Borges (2016) brings her own understanding of digital literacy, establishing that it

> “refers to the set of knowledge necessary to linguistic-social practices carried out by digital media. These practices, in turn, involve, in addition to technical skills, reading skills, ways of interacting, communicating, sharing, and understanding the media system as constituents of the contemporary world and its social practices. (BORGES, 2016, p. 720)

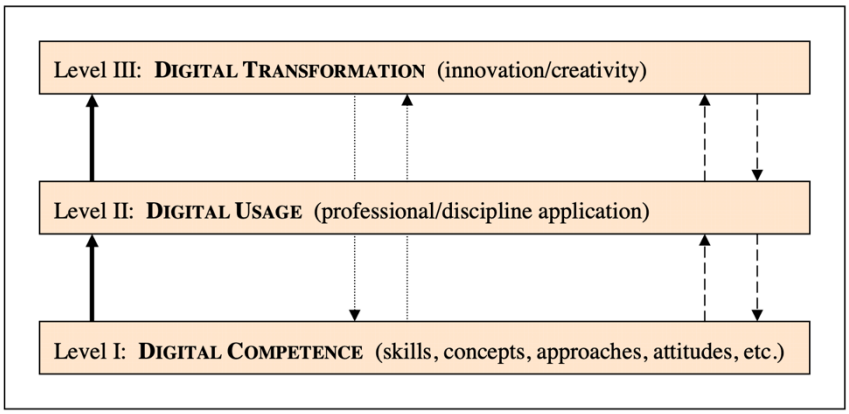
In accordance with and expanding on all of the different definitions presented above, we adopt the definition suggested by authors Martin & Grudziecki, from the European study group DigitEuLit, which understand digital literacy as

Martin & Grudziecki (2006, p. 255), within the DigEuLit Project, as previously mentioned, define the concept as

> "[…] the awareness, attitude, and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyze and synthesize digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life situations, in order to enable constructive social action; and to reflect upon this process."

The authors understand that there are three levels of Digital Literacy: Digital Competence (Level 1), Digital Usage (Level 2) and Digital Transformation (Level Three), as the figure below shows:

Figure 1 – Levels of digital literacy development



Fonte: Martin & Grudziecki (2006, p. 225)

The first level (Digital Competence[25]) is the foundation of the three-leveled system, and it involves everything from attitude to practical digital skills. This level englobes both basic visual and manual skills to more complex ones, such as evaluation and conceptual approaches, as well as attitude and awareness. These skills are activated according to the demands of the specific life situation individuals are living at the moment, and they expand them as needed as well.

The authors structure the stage of Digital Competence around 13 processes, which according to them are sequential. These processes are illustrated in

[25] The authors highlight the fact that two key words to this level (competence and skills) vary in meaning a lot, so they adopt the definition put forward by the Key Competences working group:

> "The terms 'competence' and 'key competence' are preferred to 'basic skills' which was considered too restrictive as it was generally taken to refer to basic literacy and numeracy and to what are known variously as 'survival' or 'life' skills. 'Competence' is considered to refer to a combination of skills," knowledge, aptitudes, and attitudes, and to include the disposition to learn in addition to know-how." (ibid.: 3 apud MARTIN & GRUDZIECKI, 2006, p. 256)

the image that follows. It is important to notice that Martin & Grudziecki (2006) understand “digital resource” as any item that can be stored as a digital file, and by “problem” or “task”, any area of activity.

Figure 2 – Processes of Digital Literacy

process	descriptor
statement	To state clearly the problem to be solved or task to be achieved and the actions likely to be required
identification	To identify the digital resources required to solve a problem or achieve successful completion of a task
accession	To locate and obtain the required digital resources
evaluation	To assess the objectivity, accuracy and reliability of digital resources and their relevance to the problem or task
interpretation	To understand the meaning conveyed by a digital resource
organisation	To organise and set out digital resources in a way that will enable the solution of the problem or successful achievement of the task
integration	To bring digital resources together in combinations relevant to the problem or task
analysis	To examine digital resources using concepts and models which will enable solution of the problem or successful achievement of the task
synthesis	To recombine digital resources in new ways which will enable solution of the problem or successful achievement of the task
creation	To create new knowledge objects, units of information, media products or other digital outputs which will contribute to task achievement or problem solution
communication	To interact with relevant others whilst dealing with the problem or task
dissemination	To present the solutions or outputs to relevant others
reflection	To consider the success of the problem-solving or task-achievement process, and to reflect upon one’s own development as a digitally literate person

Figure 2. Processes of Digital Literacy

Source: MARTIN & GRUDZIECKI, 2006, p. 257.

The second level (Digital Usages) is considered the most crucial and central one, and it is defined as “the application of digital competence within specific professional or domain contexts” (MARTIN & GRUDZIECKI, 2006, p. 257). Here the authors establish a connection with Wengers’ (2002) communities of practice, stating that digital uses are fully embedded within the activities of the (learning) community, and that “the drawing upon digital competence is determined by the individual’s existing digital literacy and the requirements of the problem or task” (MARTIN & GRUDZIECKI, 2006, p. 257).

The authors consider the second level, Digital Usage, to be the central level, and it involves the application of Digital Competence to the context in which the individual is inserted. In their own words,

> “Each user brings to this exercise his/her own history and personal/professional development. Digital usages are thus shaped by

> the requirements of the situation. The drawing upon digital competence is determined by the individual's existing digital literacy and the requirements of the problem or task. Digital usages are therefore fully embedded within the activity of the professional, discipline or domain community (MARTIN & GRUDZIECKI, 2006, p. 258)

It means the authors also understand that the processes which are connected to the first level (Digital Competences) are embedded within the level of Digital Usages, which is itself embedded within the task context, which is, in turn, embedded within the social action that first originated it, as illustrated by the following figure.

Figure 3 – Digital Literacy in Action

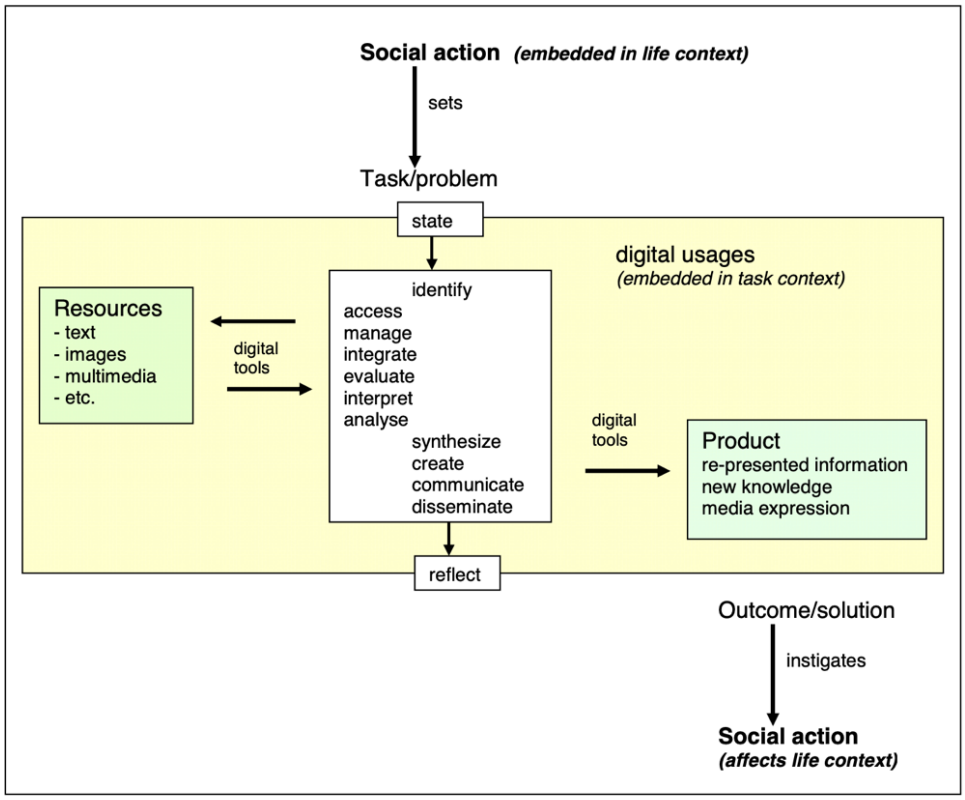


Figure 3. Digital literacy in action

Source: MARTIN & GRUDZIECKI, 2006, p. 258

The task set by the social action in the context of this research was the creation of the digital magazine Teach Tech on English Language Teaching and Digital Literacy, which then set into motion the Digital Usages, that is, the processes of Digital Literacy applied to this specific professional/learning context, as will be shown in the next sections.

The third level (Digital Transformation) is referred to as the ultimate stage, and it is achieved when “digital usages which have been developed enable innovation and creativity, and stimulate significant change within the professional or knowledge domain” (MARTIN & GRUDZIECKI, 2006, p. 259). The authors emphasize that

> “Whilst many digitally literate persons may achieve a transformative level, transformation is not a necessary condition of digital literacy. Activity at the level of appropriate and informed usage would be sufficient to describe as digitally literate. Users do not necessarily follow a sequential path at each stage. They will draw upon whatever is relevant for the life-project they are currently addressing; the pattern is more one of random rather than serial access, although there will be many cases where certain low level knowledge and skill is necessary in order to develop or understand material from a higher level.” (MARTIN & GRUDZIECKI, 2006, p. 259)

The final stage is Digital Transformation, and it “is achieved when the Digital Usages which have been developed enable innovation and creativity and stimulate significant change within the professional or knowledge domain” (MARTIN; GRUDZIECKI, 2006, p. 259). This shift could happen to and individual or to a group, and while it is achieved by many digitally literate people, it is not considered by the authors as a condition for digital literacy. To them, “Activity at the level of appropriate and informed usage would be sufficient to describe as digitally literate” (MARTIN;GRUDZIECKI, 2006, p. 259).

Another important point the authors highlight about these three phases is that they are not necessarily linear:

> “Users do not necessarily follow a sequential path at each stage. They will draw upon whatever is relevant for the life-project they are currently addressing; the pattern is more one of random rather than serial access, although there will be many cases where certain low level knowledge and skill is necessary in order to develop or understand material from a higher level.” (MARTIN & GRUDZIECKI, 2006, p. 259)).

These levels categorized by the authors will be used to analyze what was the potential for Digital Literacy development of the FDE carried out for this research. Before the analysis, however, I present, on the following section, an overview of the methodological aspects of this research.

3 METHODOLOGY

In this chapter we present an overview of the ontological and epistemological perspective that underlies this work. Then, we present the Didactic Formative Experiment and its ramifications as a research methodology. Finally, we present the research context, how the data was collected and analyzed and the Ethical procedures.

3.1 ONTOLOGICAL & EPISTEMOLOGICAL PERSPECTIVE

This study is framed by a qualitative approach from an interpretative epistemological perspective. The methodological approach merges socio-historical-cultural theoretical frameworks of learning and development (EL KADRI, 2014; VYGOTSKY, 1997; GERMANOS, 2018; VYGOTSKY, 1978; SANGER; CASSANDRE, 2019; VYGOTSKY, 1994; LEONTIEV, 2005) with Formative Didactic Experiments (DAVIDOV, 1988; SFORNI, 2015; LEONTIEV, 1983). This is all the while framed within Martin & Grudziecki's (2006) theory of Levels of Digital Literacy Development.

This research shares the same understanding of learning as El Kadri (2014, p. 130), who defines it, based on the social-historical-cultural theory, as:

> "[…] a dynamic social practice that is always forthcoming, mediated by artifacts and distributed among participants […]. In this light, human beings are seen not as merely subject to social structures but as actively contributing to their existence (BOURDIEU, 1997). I thus believe that learning occurs from social life and that meaning is co-constructed through language." (EL KADRI, 2014, p.130)

This study is also framed within the Formative Didactic Experiment theory (DAVIDOV, 1988; SFORNI, 2015; LEONTIEV, 1983), both as its methodological approach and as part of its theoretical framework, which, along with Martin & Grudziecki's (2006) theory of Levels of Digital Literacy Development, subsidizes the analysis.

3.1.1 Formative Didactic Experiment

As a methodological tool for research, the Formative Didactive Experiment is mainly based on Davidov's (1988) ideas. He understands that one cannot investigate (a learner's) higher mental functions' development without also investigating education, so the intervention of the researcher on the processes they are studying is a characteristic of this methodology.

Therefore, by this perspective, the role of the researcher is active rather than passive, and in the context of education, they will either work alongside the teacher or perform that role themselves, and "teaching and learning activities are planned specifically for research purposes, so as to set into motion the processes which will be under investigation" (SFORNI, 2015, p. 380).

Data collection sources, by this perspective, can be "video-recorded classes, written materials and other types of content produced by the teacher/researcher and by the students during the intervention" (SFORNI, 2015, p. 381).

As previously mentioned in this dissertation, this methodology was fitting for my research because, since I would be going through my graduate teaching internship, I would already be an active participant in the processes which I was planning on investigating.

It is also important to note that, following Sforni's definition of the role of the investigator on this type of methodology, I was a part of the construction of the course from the beginning, collaborating not only in the design of the classes but also coteaching.

3.2 RESEARCH SETTING

We start this section describing the historical context during which the research happened. Then, we describe the local context in which it was carried out, including the university, undergraduate program, and course it took place in. Then, we proceed to describe the participants and their background. Finally, we explain how the data was collected and the criteria chosen for analysis.

3.2.1 Historical Context

This research was carried out during the COVID-19 Pandemic, a severe respiratory disease caused by the virus known as Sars-CoV-2. The first outbreak of the new coronavirus happened in China, at the end of 2019, and it quickly spread around the Globe in the following years. Given that at first there was no vaccine or scientifically attested treatment available, it was necessary to implement several social-distancing (and hygienic) measures in order to contain the virus. One of these measurements was the closing of schools and universities, transferring lectures from physical classrooms to online ones, and teachers and professors – myself included - had to adapt their lectures and classes to online conference apps and platforms.

During this research, the classes were taught via Google Meet and Google Classroom, as the university in question granted its members with access to the G-Suite tools package and consequently suggested these platforms for the online classes.

This was also my very first experience teaching undergraduate students. That would have been a challenge on its own, as I was very insecure at first, given that barely one year before that moment I was a pre-service teacher myself, and back then quite a few of my current “students” had been colleagues which made me quite nervous (even though I would not be doing anything on my own) and, I confess, had me questioning if I could truly contribute to those people’s learning process in any way.

Dealing with all of this on top of handling all of the restrictions and changes posed by the Covid-19 pandemic was a completely different level of challenge. As I’ve mentioned before, I had previous experiences with technologies and language teaching, but teaching 100% online was something I had never done before, and I would have had no idea where to even begin were it not for the FDE and the co-teaching and planning process with my fellow researcher and the two teacher educators that were co-teaching and this course.

3.2.1.1 Local context

The State University of Londrina was the educational context inside which the research was carried out, even though the participants, professors and the

researcher involved were not physically there as explained above. The University is located in a city of the same name (Londrina), in the state of Paraná, southern Brazil. 74% out of its 81 undergraduate programs have received the highest score in one of the main indexes for higher education quality in Brazil, called CPC[26] (in Portuguese, *Conceito Preliminar de Curso*) which is measured by Brazilian's Ministry of Education yearly.

The Undergraduate Program to which the participants belonged is called *Letras Inglês* (English Language Teacher Education program), which prepares students to be English teachers in Brazil. During the four years of the program, the pre-service teachers study the English language and literature, as well as other language learning and teaching related topics, such as didactics, language perspective, discourse studies, etc. The pre-service teachers are also required to complete two internship programs as English teachers during the final two years and write an academic article about one of those experiences as a final assignment before graduation. The *Letras Inglês* Undergraduate Program is one of those who received the highest scores in many important indexes and evaluations in Brazil, such as The National Student Performance Exam (in Portuguese, ENADE).

Another requirement of the program for 3rd and 4th year students is the completion of an elective course every semester during these final two years. Students are allowed to choose between the courses some professors offer every six months, and not necessarily from the same language department (students may opt for an elective course offered by a professor from the Portuguese undergraduate program, for example).

The elective course that completes the context of this research was called "Technologies, Digital Literacy, & Language Teaching". As previously mentioned, this was an elective course offered to 3rd and 4th year students, and it had a total workload of 30 hours.

The course syllabus included the conceptualization, distinctions and approximations between technology, digital literacy, and language teaching; the affordances of digital tools for language teaching, and didactic proposals developed by teachers.

[26] Source: <https://www.gov.br/inep/pt-br/acesso-a-informacao/dados-abertos/indicadores-educacionais/indicadores-de-qualidade-da-educacao-superior>

The main goals of this course, according to the course syllabus, were: to develop concepts related to digital literacy as a mediator of language teaching proposals; develop knowledge and skills related to the use of technologies and digital literacy in language teaching; get to know and analyze didactic proposals developed by teachers of digital literacy and language teachers; propose pedagogical solutions during problem-solving exercises related to teaching contexts; develop online collaboration skills to create digital publications on technologies, digital literacy and language teaching;

The contents listed in the course program and the planned chronogram are drawn in the chart below:

Chart 2 – Course content and chronogram

Date	Content
August	Technology and language teaching; Affordances of digital tools in language teaching
September	Digital Literacy; Distinction between technology integration and Digital Literacy
October	Similarities between technology, digital literacy and language teaching Experiences in the development of digital literacy in language teaching
November	Digital publication creation tools

Source: the author.

The teaching procedures we relied on included the alternation between synchronous and asynchronous online meetings, as well as between meetings which involved the entire class and others in smaller groups (we also made it clear to students that we were available for individual meetings if necessary).

On top of that, the following items were also listed as teaching procedures in the syllabus: procedures related to the principles of the Formative Didactic Experiment; inverted classroom procedures: studying materials (texts, videos) individually in advance and carrying out tasks in groups; problem-solving; online interactions with the course's teachers, colleagues, teachers from elementary schools and language institutes; individual and group practical tasks; experimenting with and reflection upon the use of technological tools.

In order to achieve these goals and cover these contents in a way that was coherent with the social-historical-perspective of learning and teaching (which all four of us shared), we organized the course around the following proposal: students

would work on the creation of an issue for a digital magazine about technology and education, specifically regarding language teaching. The development of this magazine would be a course-long goal, and it would be developed section by section throughout the course (as opposed to being one big final assignment students would only hear about at the end of the course).

The idea for such proposal came from one of the teacher educators, which she drew from the Social Activity Theory – one she already believed in and tried to incorporate in most of her classes. The Social Activity Theory proposes teaching through social activities, that is, activities in which the learner is in contact with other cultural and social contexts (LIBERALI; SANTIAGO, 2016). Me, my fellow researcher and the other teacher educator professor responsible for the course, who was also our research supervisor, suggested the Formative Didactic Experiment as a way of fostering learning, since we all shared the concern that the emergency remote learning context would interfere with that process.

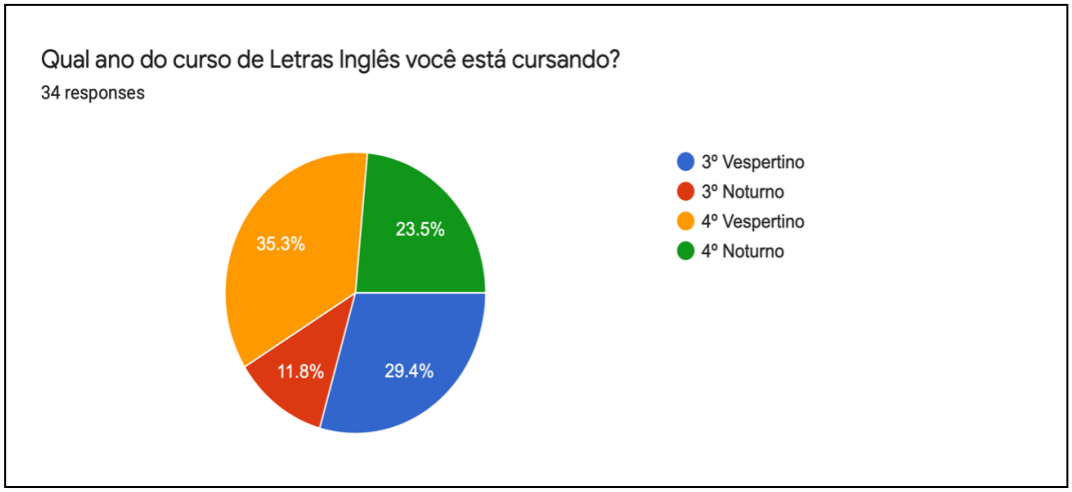
Finally, the items and criteria for evaluation listed in the syllabus were the following: creation of a tutorial on the use of a digital tool to teach a certain linguistic-discursive content: step-by-step presentation of how to use the tool; justification for using the tool to achieve linguistic-discursive objectives. Individual work presented in digital format; creation of a didactic activity: ability to establish goals related to digital literacy and linguistic-discursive development; ability to plan activities aimed at the development of students' digital and linguistic-discursive literacies; individual work presented in digital format; creation of a digital magazine issue about technology, digital literacy, and language teaching: collaboration, commitment to carrying out tasks distributed in the team. Group work presented in digital format. synthesis of the contents studied: appropriation of concepts, establishment of theoretical-practical articulations. Individual work presented in digital format; self-assessment: ability to explain your initial level of knowledge and skills for the use of digital tools in language teaching and assess your development throughout the course. Individual work presented in digital format.

As the analysis will show, all of the criteria mentioned above was met, through the activities developed along the course.

3.2.1.1.1 Participants

The participants of this study were the pre-service teachers enrolled in the elective course just described who answered the Consent Form. A total of 34 pre-service teachers answered the Consent Form (in Portuguese, known as “Termo de Consentimento Livre e Esclarecido”) – (ANNEX 1), which was handed to them via Google Forms and in Portuguese. As the print-screened graphic below shows, out of these 34 for students, 10 were 3rd year afternoon students, (blue) 4 were 3rd year evening students (red), 12 were 4th year afternoon students (yellow) and 8 were 4th year evening students (green).

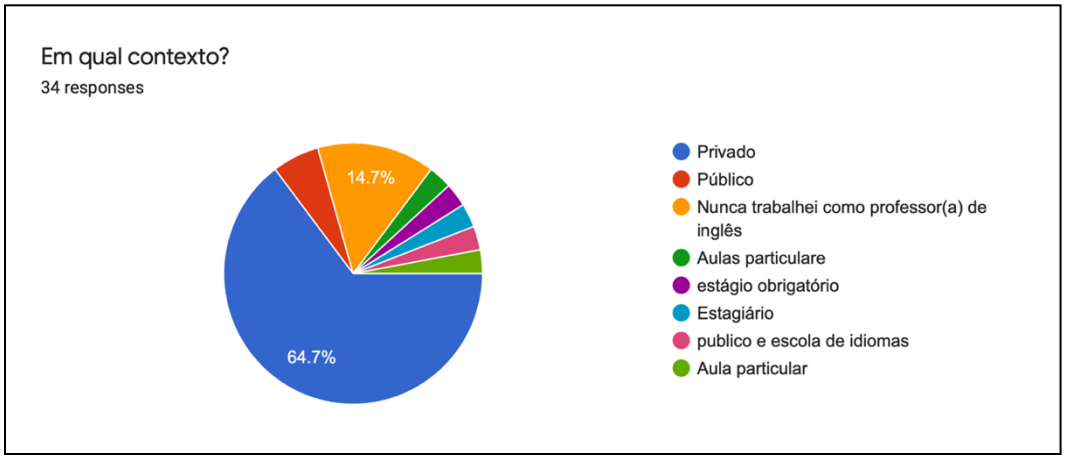
Figura 4 – Which year of the undergraduate program are you in?



Source: the author.

50% of these students were already working as English language teachers, 35% had worked as English language teachers at some point and 14% had never done so. The majority of these students mentioned working (or having worked) in private schools (dark blue and pink, 23 students). Other contexts mentioned by the students were: public schools (red and pink, 3 students); private classes (dark and light green, 2 students); internship program (purple and light blue, 2 students). 5 students had never worked as teachers yet (yellow). The print-screened graphic below illustrates this data.

Figura 5 – Which context are you currently teaching in?

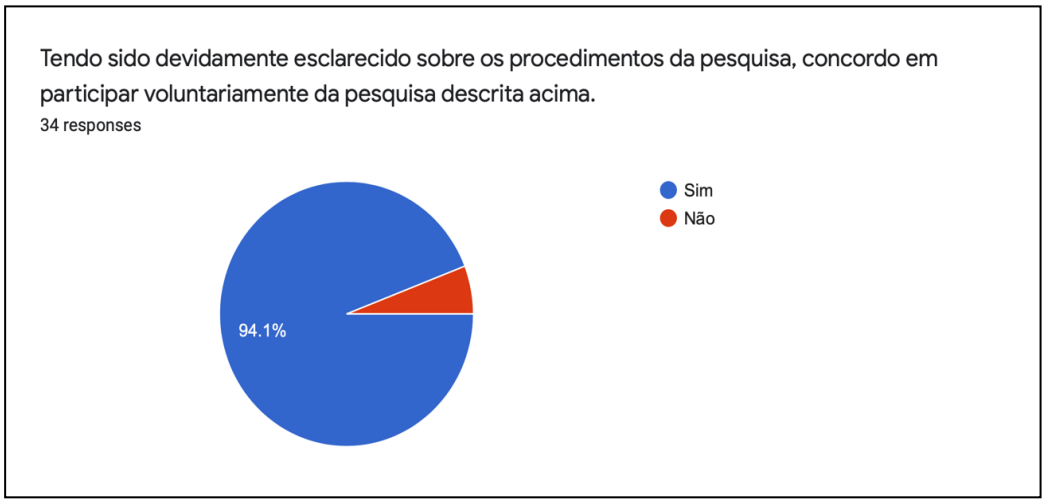


Source: the author.

The amount of time they already had experienced inside a classroom as teachers varied a bit, the longest being 5 years and the shortest being a few months (apart from those who had never had such experience before).

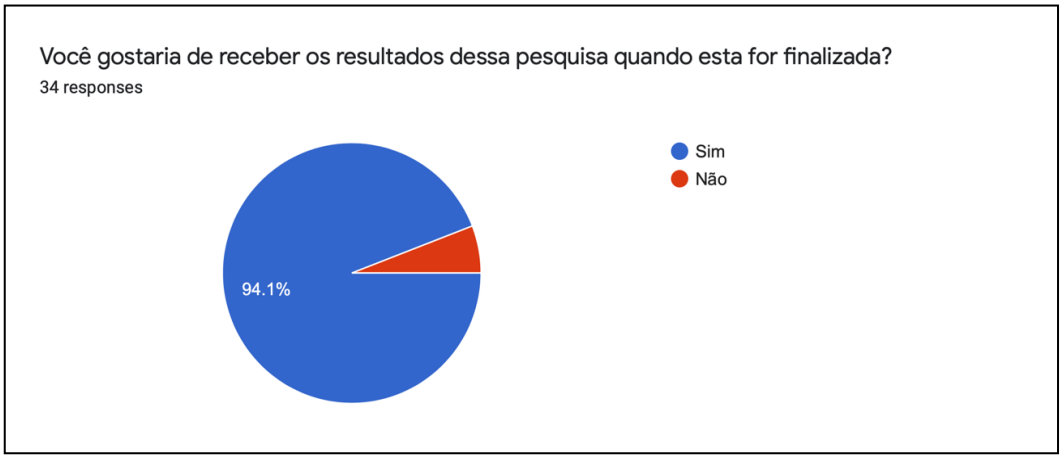
Out of the 34 students who responded the Form, 32 agreed to participate in the research, and out of these 31 declared that they would like to receive the results of this research once it is completed.

Figura 6 – Participation consent



Source the author.

Figura 7 – Research feedback



Source: the author.

On the same form, the students were asked to describe what their general relationship regarding technology was like. The chart below presents the students' answers in their own words. It is important to note that they were also given a chance to choose what they would like to be called in the research, so the names listed in the chart are those chosen by the students themselves.

Chart 3 – Participants' relationship with technology

Name	**Como você se descreveria em relação a tecnologia?**
Maria Luiza	*"Uso a tecnologia muito para fins pessoais e acho fácil, a maioria das vezes, a forma como estamos estudando."*
Nathalie	*"Eu tenho facilidade na questão da tecnologia, pois uso no trabalho, estudos e lazer, mas me dedico a aprender sobre sempre que há algo novo online."*
Bárbara	*"Acredito que tenho uma boa relação, aparentemente sei mexer bastante em várias ferramentas."*
Lais	*"Utilizo a tecnologia no meu dia a dia, para o trabalho e para os estudos. Era essencial para mim antes da pandemia, pois meu trabalho é online, mas agora com a pandemia, tudo está sendo online, inclusive os estudos."*
Mirian	*"Use tecnologia todos os dias desde a infância, me considero uma pessoa muito familiar com as tecnologias."*
Tati	*"Tenho dificuldade em aprender a usa novas technologias e acredito que é mais fácil aprender usando mesmo. Quando a tecnologia tem uso lógico, consigo usar e facilita a minha vida."*
Denise	*"tenho facilidade com tecnologia, porém não tenho aparelhos tecnológicos bons"*
Beatriz	*"Gosto muito, uso tecnologia com frequencia e faciliade."*
Luis Henrique	*"Eu sou de boa, gosto. Porém, as vezes acho algumas ferramentas um pouco complicadas, por eu não possuir total dominio sobre tecnologias."*
Fernanda	*"Acredito que seja boa, eu tento usar pra lazer, como ler, ou para*

	manter contato com as pessoas, por redes socias e claro hoje em dia durante a pandemia na faculdade. Eu não tenho muita dificuldades não eu gosto de explorar e aprender a mexer nas coisas. E acho muito interessante aprender em como trazer ela pra dentro da sala de aula e usar como uma ferramenta que ajuda no aprendizado."
Gabrieli	*"Acredito que por ter contato com tecnologias desde muito pequena, pra mim é natural utiliza-la para trabalho ou uso pessoal. Eu fiz pesquisa sobre uso de tecnologias na formação de professores na graduação, então acredito que isso me possibilitou um olhar diferente para o uso em sala de aula. Acredito também que atualmente é essencial esse uso, devido às mudanças na sociedade."*
Maria	*"A tecnologia está bastante atrelada a minha rotina, seja no trabalho, faculdade ou vida pessoal. Me sinto bastante confortável utilizando-a, apesar de sentir dificuldades em algumas ferramentas."*
Lais Becheri	*"eu particularmente não gosto muito de trabalhar com tecnologia, eu prefiro a moda antiga kkkk, mas nesse momento no qual estamos vivendo sei que é importante demais estar aprendendo sobre."*
Izabella	*"Minha relação com a tecnologia começou quando eu era nova, com jogos. Só mais tarde eu comecei a usar para fazer trabalhos na escola, etc. Eu diria que hoje a tecnologia está muito presente na minha vida."*
Yasmin Zampieri	*"Eu dependo muito da internet, especialmente para a faculdade e para meu trabalho (ministrar aulas online), as dificuldades que enfrento são que ocorre vezes em que a internet desconecta e eu preciso avisar os alunos o que houve. Como moro com meus pais, às vezes ocorre de ter barulho que acaba atrapalhando um pouco também. A grande facilidade é que não preciso sair de casa e não "gasta" tempo para se locomover."*
Anna	*"Eu uso muito, especialmente agora considerando o contexto remoto. Não tenho muitas dificuldades, porém admito que não gosto muito quando envolve criar vídeos ou usar ferramentas pra edição, e etc."*
Thalita	*"Eu vejo a tecnologia como uma ferramenta que nos conecta com pessoas que estão distante de nos, e nos ajuda como uma ferramenta de ensino. A tecnologia está presente 24 hrs no meu dia, tanto para passar o tempo vendo as redes sociais como estudando e trabalhando. A dificuldade que sinto é quando a internet nao funciona ou o computador trava que vemos quão dependente fomos dessa ferramente."*
Cecília	*"Eu uso bastante tecnologia, tanto para fins pessoais (como entretenimento) quanto para fins profissionais (ainda mais nesses tempos de pandemia). Gosto bastante, acho que realmente facilita muitas coisas porém não é tudo benéfico."*
Philipp	*"gosto muito de tecnologia. Para ambos os fins. Acredito que tecnologia na sala de aula é uma ajuda/complemento bem vindo."*
Rafaela	*"Uso pessoal e profissional todos os dias, aprendo facil e amo*

	conhecer novas ferramentas."[27]
Larissa	*"Eu sou uma pessoa da geração Z e estou habituada com a tecnologia. Eu tenho facilidade em me engajar em diferentes plataformas digitais, apesar de evitas as redes sociais. Os meios digitais sempre me ajudaram na aquisição de conhecimento e nos trabalhos da universidade, ainda mais agora ela abrange grande parte da minha vida sendo que sou totalmente dependente dela pra fazer minhas atividades."*

Source: the author.

All of the participants presented in the chart above were featured in the analysis. We examined the data looking for indications of the development of the concept of Technology and Digital Literacy, so the participants are mentioned when they participate in moments in which that development is evident or hinted at. However, all of them developed an issue of the Teach Tech magazine within their groups, which we also included in the data, so even if they are not directly mentioned during the analysis, they still took part in the research.

3.3 Data Collection & Analysis

In this section, the data collection and analysis process is explained, including the platforms and instruments used as well as how the analysis was done in accordance to the theoretical framework.

3.3.1 Data Collection

Data was gathered through recordings of each meeting (I participated in and collected data from both afternoon and evening classes) as well as through Google Classroom, which is where, as previously mentioned, we registered what was done in class, where students posted their activities for both synchronous and asynchronous classes and where we also sometimes interacted with them through questionaries posted on it and created on Google Forms.

The elective course had a total of 15 classes. Out of these 15 classes, 7 were synchronous, meaning students, professors and researchers met online via Google Meet to perform the activities pre-determined by the professors and

[27] Participants' answers will be left in the language they were written (Portuguese) so as to avoid any change in meaning regarding what they said about their relationship with technology.

researchers. These activities and its' guidelines were, most of the times, available to students on Google Classroom a few days ahead of the class. The remaining 8 classes were asynchronous, which means the professors and researchers posted assignments on Google Classroom that students could complete on their own timetable, as long as they had completed them before the following synchronous class. The chart below specifies which classes were synchronous, asynchronous, or cancelled, and what was the source of data collection on each one.

Table 1– Data Collection

Class	Date	S / A (Synchronous vs. Asynchronous)	Participants	Data Collection	Recording Length
01	13/08	A	Afternoon Group	Google Classroom	-
			Evening Group	Google Classroom	
02	20/08	S	Afternoon Group	Google Meet Recording	01h 23min
			Evening Group	Google Meet Recording	01h 22min
03	27/08	A	Afternoon Group	Google Classroom	-
			Evening Group	Google Classroom	
04	03/09	S	Afternoon Group 1	Google Meet Recording	01h 19min
			Afternoon Group 2	X	X
			Afternoon Group 3	Google Meet Recording	01h 13min
			Afternoon Group 4	Google Meet Recording	01h 16min
			Evening Group 1	Google Meet Recording	01h 03min
			Evening Group 2	Google Meet Recording	01h 02min
			Evening Group 3	Google Meet Recording	0h 54min
05	10/09	A	Afternoon Group	Google Classroom	-
			Evening Group	Google Classroom	
06	17/09	S	Afternoon Group	Google Meet Recording	01h 46min
			Evening Group	Google Meet Recording	01h 11min
07	24/09	A	Afternoon Group	Google Classroom	-
			Evening Group	Google Classroom	
08	01/10	S	Afternoon Group 1	Google Meet Recording	0h 46min

			Evening Group	Google Meet Recording	01h 07min
09	08/10	A	Afternoon Group	Google Classroom	-
			Evening Group	Google Classroom	
X	15/10	(break)			
10	22/10	A	Afternoon Group	Google Classroom	-
			Evening Group	Google Classroom	
11	29/10	S	Afternoon Group	X	X
			Evening Group	Google Meet Recording	0h 37min
12	05/11	A	Afternoon Group	Google Classroom	-
			Evening Group	Google Classroom	
13	12/11	S	Afternoon Group	Google Meet Recording	0h 53min
			Evening Group	X	X
14	19/11	A	Afternoon Group	Google Classroom	-
			Evening Group	Google Classroom	
X	26/11	(week off to finish assignments)			
X	03/12	(re-scheduled due to other academic events students were taking part in)			
15	09/12	S	Afternoon Group	X	X
			Evening Group	Google Meet Recording	01h 31min

Source: the author.

3.3.1.1 Data Analysis

All of the classes included in the table above were recorded and transcribed. Also, with each class, activities and assignments were posted and developed in Google Classroom. This corresponds to about one semester's worth of data. In order to reduce this amount so that we could analyze with depth, we made a few selective cuts.

Firstly, we made the choice to focus the analysis mostly on the afternoon group. The word "mostly" is used here because some of the activities we developed during the course, through Google Forms, for instance, were anonymous, so in those cases we are not able to distinguish what data comes from the afternoon group and what data comes from the evening group. The activities and assignments were all included in the analysis.

The reason for choosing the afternoon group is mostly justified in the available data. When the analysis begun, out of the two groups, the afternoon was the one with enough data to allow an analysis of all the stages of the FDE in detail.[28]

In order to further organize the presentation of the data, we chose to highlight, in the analysis section, a few teaching episodes.

A teaching episode is defined by Moura (1993) as

> "[...] that moment when the situation we want to investigate becomes evident, which can be the learning of a concept, the situation of the students raising hypotheses in a given problem, the students' speech after a destructuring question, etc. It is part of teaching and is characterized by the set of actions that trigger the processes of seeking the answer to the problem in question. The main (or fundamental) characteristic is that it is a complete cycle in the process of interaction between the subject, mediated by the object of knowledge" (CARVALHO, 1993, p. 04).[29]

We highlight the following three teaching episodes along the analysis:

Chart 4 – Teaching Episodes

Date	Teaching Episode
20/08	Reflecting on Maleficents' Story
17/09	Timeline Presentation
01/10	Rubrics

Source: the author.

It is important to remark that these three teaching episodes are **not** the only moments in the analysis in which we rely on transcripts from the classes. These

[28] Some of the data from the evening group was lost due to Google Meets' random storage of class recordings. Most of the times, the recordings would be automatically stored in mine or one of the professor's drives, and the link sent to the corresponding e-mail. However, in certain occasions, the recording and the link would be sent randomly to one of the participants of the meeting. We asked the pre-service teachers to send it to us if they received it, and some did, but there was some data that we were unable to locate.

[29] Originally:

> [...] àquele momento em que fica evidente a situação que queremos investigar, esta pode ser a aprendizagem de um conceito, a situação dos alunos levantando hipóteses num problema aberto, as falas dos alunos após um pergunta desestruturadora, etc. Ele é parte do ensino e se caracteriza pelo conjunto de ações que desencadeia os processos de busca da resposta do problema em questão. A característica principal (ou fundamental) é que seja um ciclo completo no processo de interação entre o sujeito, mediado pelo objeto de conhecimento (CARVALHO, 1993, p. 04).

were the three moments we could identify that correspond to Moura's definition of a teaching episode, and they all happened during synchronous classes.

However, we also rely on transcripts in a few occasions to analyze the activities and assignments through Sforni's principles and to look at Digital Literacy development as well, based on Allan Martin & Jan Grudziecki (2006) theory.

In summary, we present three teaching episodes, in which we can clearly see how the pre-service teachers are mentally operating with the concepts being taught (according to the researchers' perspective) as well as excerpts of assignments and activities to present and analyze the Formative Didactic Experiment caried out (once again, according to the researchers' perspective). We analyzed all of the assignments and activities of the afternoon group, but we present here the ones in which the concepts of Technology and Digital Literacy (as well as Digital Literacy levels) are highlighted and how the pre-service teachers were operating with them were evident. On those days in which the assignments were performed in smaller groups, we analyzed and present assignments and activities from Group 01, which was the group that I accompanied closely in the afternoon.

3.4 ETHICS

This section describes the ethical foundation of this research, explaining the literature used as to justify and describe the ethical choices made.

This research project undertook Burocratic and Emancipatory Ethical procedures (EGIDO, 2015). Regarding the burocratic ones, it was submitted and approved by the Brazilian national research ethics committee via Plataforma Brasil (process number 4.246.558). Plataforma Brasil[30] is a national and unified database of research records involving human beings which englobes the entire CEP / Conep system. Through this platform, it is possible for research projects to be followed up in their different stages - from submission to final approval by CEP and Conep, when necessary - making it possible to follow up even the field phase, the submission of partial reports and final research reports (once finished). The system also allows the presentation of documents also in digital media, providing society with access to public data of all approved research. Through the Internet, it is possible for everyone involved

[30] <https://plataformabrasil.saude.gov.br/login.jsf>

to access, through a shared environment, the gathered information, significantly reducing the processing time of the projects throughout the CEP / CONEP system.

As mentioned previously in this chapter, the participants of this research answered a Consent Form, which was handed to them via Google Forms and in Portuguese. This document was also properly attached to the project submission to Plataforma Brasil, having also been approved before it was made available to the participants. Those who chose to participate were able to choose what they would like to be called in the research.

Based on the Emancipatory perspective, the results of the analysis will be sent back to the participants, so that they can offer their own opinions regarding the conclusions of the study.

They could decide whether or not they would like to receive the results once the research is finished. The answers to these questions were already mentioned in the previous sections of this chapter.

In the following section, I will present said analysis and the conclusions driven from it.

4 ANALYSIS

In this chapter we present the analysis. Our aim is not only to present the Formative Didactic Experiment[31] we carried out for the development of digital literacy analyzed through the principles of the FDE, by the researcher's perspective, but also to demonstrate if there is evidence of digital literacy development.

As previously mentioned, we proposed the creation of a Digital Magazine on Language Teaching, Technology and Digital Literacy. This was one of the ways we attempted at tending to the 5 Principles for the Formative Didactic Experiment put forward by Sforni (2015): we aligned the Social Activity Theory (LIBERALI, 2016) to the FDE.

El Kadri et al. (2021, p. 176) define Social Activity as follows:

> "Social activities can be defined as those "[...] in which subjects are in interaction with other determined and historically dependent cultural contexts." (LIBERALI; SANTIAGO, 2016, p. 19). In other words, they are actions performed between subjects enrolled in a socio-historical-cultural context (social practices). Based on this understanding, the re-organization of the curriculum of a course […] through social activities, demonstrates its potential for the "unencapsulation of Contents" (ENGESTRÖM, 1999, 2002; LIBERALI, 2019). As pointed out by El Kadri et al. (2020), the unencapsulation of the curriculum aims to "[...] transform school work into a matrix of socialization and action in the community and in the world." (LIBERALI, 2019, p. 33), that is, it means prioritizing a curriculum that mobilizes knowledge and practices that favor the intersections between individual and collective and between local and global, valuing different voices and knowledge and agency/protagonism of students. (EL KADRI et al., 2021, p. 176)[32]

[31] As previously mentioned, our focus is to present the actual Formative Didactic Experiment produced, that is, the final result of our discussions, and not how it was carried out in the classroom. The process of how what we present here was designed and what that meant for us as our own formative experience is the focus of Silvia Calazans' work (2022, to be published).

[32] Originally,

> Atividades sociais podem ser definidas como aquelas "[...] em que os sujeitos estão em interação com outros contextos culturais determinados e historicamente dependentes." (LIBERALI; SANTIAGO, 2016, p. 19). Em outras palavras, são ações realizadas entre sujeitos inscritas em um contexto sócio-histórico-cultural (práticas sociais). Partindo desse entendimento, a reorganização do currículo da disciplina, foco deste trabalho, por meio de atividades sociais, demonstra seu potencial para a "desencapsulação dos Conteúdos" (ENGESTRÖM, 1999, 2002; LIBERALI, 2019). Conforme apontado em El Kadri et al. (2020), a desencapsulação do currículo visa "[...] transformar o trabalho escolar em uma matriz de sociali- zação e ação na comunidade e no mundo." (LIBERALI, 2019, p. 33), ou seja, signi- fica priorizar um currículo que mobilize conhecimentos e práticas que favoreçam

With that in mind, our goal was to organize the curriculum of our course so as to try and achieve, beyond the Sforni's (2015) principles, the "unencapsulation" of contents mentioned above, as well as the promotion of agency and protagonism of our pre-service teachers.

In order to achieve all of these goals and objectives, we decided to structure the entire course around the production and creation of a digital magazine, which would be entitled Teach Tech, that had as its main theme technology and language teaching.

The chart below shows the sections we had planned to develop for this magazine throughout the course, as well as what content was expected to be featured in each of them.

Chart 5 – Teach Tech

Magazine Section	Content
Technology & Me	Personal relationships with Technology
Learning from the Past	A historical glimpse of the use of technology in language teaching
In other words	Ideas put forward by prominent scholars translated into everyday language, illustrated by examples
Step-by- step	Tutorial videos walking through the steps needed to use digital tools and possible uses in language learning
Digital Literacy & Language Learning	Lesson plans aimed at developing both linguistic and digital literacy skills

Source: the author.

The magazine should be developed in groups, and this development should happen throughout the course (not as a final assignment).

On the following sections, we present how this development was organized (through the FDE and Sforni's (2015) Principles), as well as analyze it (also through the Principles and through Martin & Grudziecki (2006) levels of Digital Literacy development).

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as intersecções entre individual e coletivo e entre local e global, valorizando dife- rentes vozes e saberes e agência/protagonismo dos estudantes.

4.1 TEACHING THAT PROMOTES DEVELOPMENT & THE ACTIVE CHARACTER OF LEARNING

Principle 01, Teaching that Promotes Development, and Principle 02, The Active Character of Learning were the two main principles that guided us as we designed the first four classes of the FDE (Formative Didactic Experiment). The chart that follows presents an overview of these classes and these principles.

Chart 6 – August 13th to September 3rd

Date	**Class/Assignment Description**	**FDE Principle 01: Teaching that promotes Development – Teacher Actions**	**FDE Principle 02: The Active Character of Learning**
13/08	1st Asychronous Class of the course. Assignment: develop a Mind Map on the topic "Technology in language teaching".	a) assessment of the actual level of development and prediction of the potential level of development; b) use of activities that mobilize the Higher Mental Functions; c) creation of situations in which students verbally express what and how they are thinking (how they are mentally acting with the concepts).	"a) incorporation of problem-solving situations that allow the student to be inserted in the investigative horizon that first originated the concept; b) Planning moments for students to dialogue with each other and prepare collective summaries, even if they
20/08	1st Synchronous Class of the course. Pre-service teachers, researchers and professors reflect on concepts and types of Technology.		
26/08	Asynchronous Class. Assignment: develop a Digital Story that showcases your personal relationship with technology.		
03/09	Synchronous Class. Pre-service teachers, researchers, and professors present, reflect and analyze the Digital Stories produced in small groups.		

			are not definite; c) guidance of the process of elaboration of conceptual summaries by students." (SFORNI, 2015, p. 387)

Source: the author

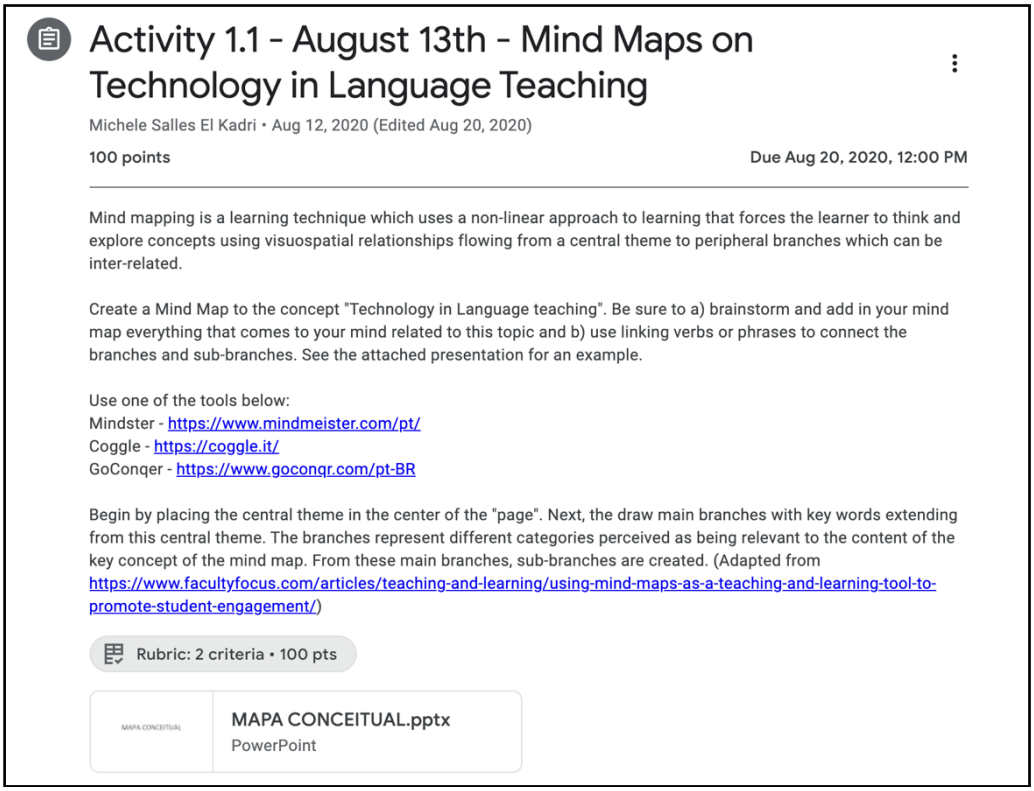
As we can see on the previous chart, the activities designed in for these first four classes of the course were meant to be the didactic transposition of these two principles. We started the experiment with an asynchronous class, on August 13th, which assigned the pre-service teachers with the creation of a Mind Map on the topic "technology in language teaching". On August 20th, we held the first synchronous class of the course, which contained activities that aimed at guiding the pre-service teachers' to further reflect on the topic of the Mind Map from the previous class (technology in language teaching). On August 26th, the assignment was the development of a Digital Story based on the pre-service teachers' personal relationships with technology. This Digital Story and its creative process were the focus of the activities proposed on September 3rd.

Now, I present and analyze, chronologically, each one of these activities.

August 13th

The assignment instructions for this class and its corresponding deadline were posted on the Google Classroom page, as we can see in the image that follows.

Figure 8 – August 13th



Source: the author.

As previously mentioned, it was an asynchronous class. In these kind of classes, we would normally ask the pre-service teachers to perform one activity creating something that would take at least the equivalent amount of time of a synchronous class to get done (about two hours). However, they did not have to hand it in on the same day. In fact, we would normally allow them to hand in their activities any time before the following class, which would normally be a synchronous one. For this class, the assignment was the creation of a Mind Map on the given topic of Technology in Language Teaching.

This class and this assignment were elaborated based on Principle 01: Teaching that Promotes Development. According to Sforni (2015), to be guided by Principle 01, that is, Teaching that Promotes Development, means to plan, execute, and evaluate the learning process having the learner's next development level in mind. So, to us, Mind Maps were the way we found to map student´s knowledge on digital literacy and assess what the next steps should be.

Sforni (2015) points out that Davídov and Márkova (1987) understand development as "qualitative progress regarding the level and the kind of capacities, the kind of activities, etc. which individuals appropriate" (DAVÍDOV; MÁRKOVA, 1987

apud. SFORNI, 2015, p. 382)[33]. When the authors refer to “qualitative progress”, it is implied that development is a process which involves going from one level to the next. Therefore, if an educator wishes to foster room for the promotion of development or, in other words, take their students to the next level, it is necessary to know in which level they currently are first (SFORNI, 2015). That is the first suggested teacher action for Principle 01: to assess the current level of development and predict the potential level of development. In other words, to work within the Zone of Proximal Development.

The Zone of Proximal Development as defined by Vygotsky (1978) is the distance between the actual developmental level and the level of potential development. The actual developmental level refers to what the learner already knows, the associations and mental functions they have already developed. The level of potential development is a prediction of what the learner will be able to achieve with the help of an educator or a more experienced peer (or, in some cases, both). Once that distance is identified, the educator is able to design every step of the teaching process having the next level of development as a goal.

Our goal with this assignment was to identify the pre-service teachers’ ZPD, that is, to understand what level of development (regarding technology) they were at the very beginning of the course and predict where they could go with our interference, so that we could adjust the planning of the rest of the course (as needed) so that it would always be oriented towards the next level of development, thus following Principle 01: Teaching that Promotes Development.

Another suggested teacher action for Principle 01 is to mobilize the learner’s higher mental functions. Vygotsky (1978) understands higher mental functions as those complex cognitive functions which are “socially acquired, mediated by social meanings, voluntarily controlled and exists as a link in a broad system of functions rather than as an individual unit” (SUBBOTSKY, 1996, s/p). Voluntary memory and attention are examples of higher mental functions (WERTSCH and STONE, 1985).

Sforni (2015) argues that the higher mental functions tend to be developed as they are activated, and that activation, according to the author, should happen through the assignments and activities proposed. Sforni (2015) also highlights

[33] Originally, “[...] o desenvolvimento se caracteriza, principalmente, pelos avanços qualitativos no nível e na forma das capacidades, nos tipos de atividade etc. dos quais se apropria o indivíduo” (Davídov; Márkova, 1987, p. 322 apud Sforni, 2015, p. 382).

that the potential an activity has to activate the learners' higher mental functions varies greatly, and it should be analyzed and determined individually and by the educator. However, she also mentions a few activities that tend to work less than others: activities that fall under the categories of "follow the example, list, exemplify" etc tend to be less effective in activating higher mental functions then others that could be classified as "analyze, justify, demonstrate", etc. (SFORNI, 2015).

That is why we decided to propose a Mind Map for this first class. We believe that a Mind Map is a "demonstrate" kind of activity, so it had great potential to activate the pre-service teachers' higher mental functions, which means, consequently, that there is potential for development. Once again, Principle 01: Teaching that Promotes Development, was the leading principle behind the class and the assignment.

We started the instruction by providing a definition of what Mind Mapping is, and then asked the pre-service teachers to create one regarding the concept of "Technology and Language Teaching". We also provided a few tech resources as suggestions for them to use, and posted and described a sample Mind Map, which gave out a general idea of what we were expecting the finished assignment to look like.

An important detail here, which is also related to the Principle 01: Teaching that Promotes Development, is the instruction to "use linking verbs or phrases to connect the branches and sub-branches" (Figure 8). This attention to language and verbal expression is the third suggested teacher action for Principle 01: the "creation of situations in which students verbally express what and how they are thinking (how they are mentally acting with the concepts)"(SFORNI, 2015, p. 385). This is important because language and verbal expression are the most effective ways we can identify how the learners' (in this case, the pre-service teachers) are mentally operating with the concepts being taught (SFORNI, 2015); VYGOTSKI, 2001).

This detail allows us to also classify this activity as an "analyze" kind of activity, because choosing linking verbs to distribute through the Mind Map would require the pre-service teachers to *analyze* the associations they'd made to the main concept, further confirming the potential of this activity to put the higher mental functions in motion, which is tightly linked to development (SFORNI, 2015).

The topic "Technology in Language Teaching" was chosen following the syllabus of the course, since the concept of Technology was the first one to be

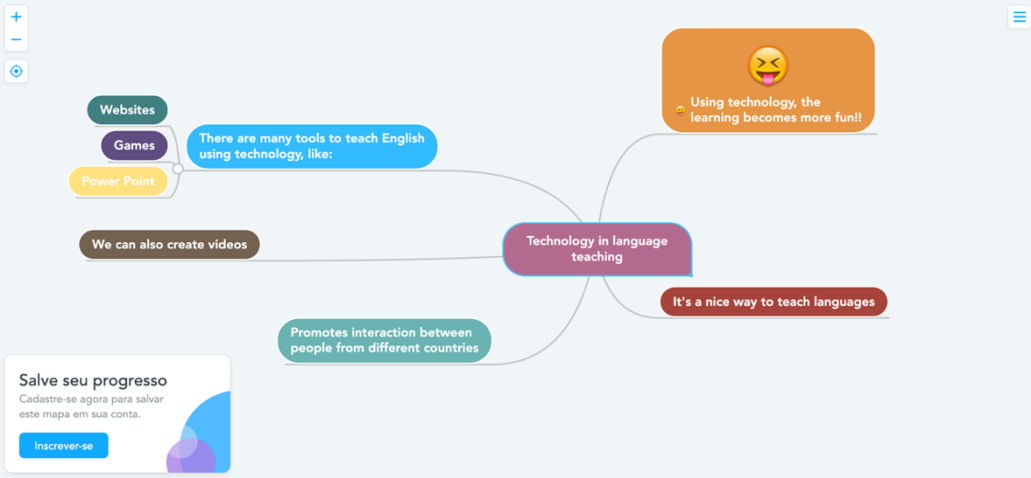
thought. Because scientific concepts (VYGOTSKI, 2001) are part of “a complex system of associations and relationships in which a given object is inserted and that were formed in the multi-century history of humanity” (LURIA, 1994, p. 20), and are expressed through language (VYGOTSKI, 2001), a Mind Map would also allow us to very easily see whether or not the pre-service teachers were mentally operating with this concept and to what extent, thus fulfilling our goal for this initial class (assessing the actual developmental level and predicting the potential developmental level).

An analysis of the Mind Maps that were handed in indicated that, apart from very few and very shy exceptions, at that point, the pre-service teachers were not operating with Technology as a scientific concept - it was mostly represented as an everyday or spontaneous concept (LURIA, 1994; VIGOTSKI, 2001).

Spontaneous concepts are developed by “the individual's direct contact with the object, their attention being directed to the thing itself” (CLEDER, 2012). In this case, it meant that the pre-service teacher’s representation of Technology within their Mind Maps was mostly based on what they’ve learned and concluded of Technology from their own, personal, and practical experiences with it, as opposed to indicating scientific knowledge.

Barbara’s Mind Map is a good example of a representation of Technology as an everyday concept.

Figure 9 – Mind Mapping Technology - Barbara



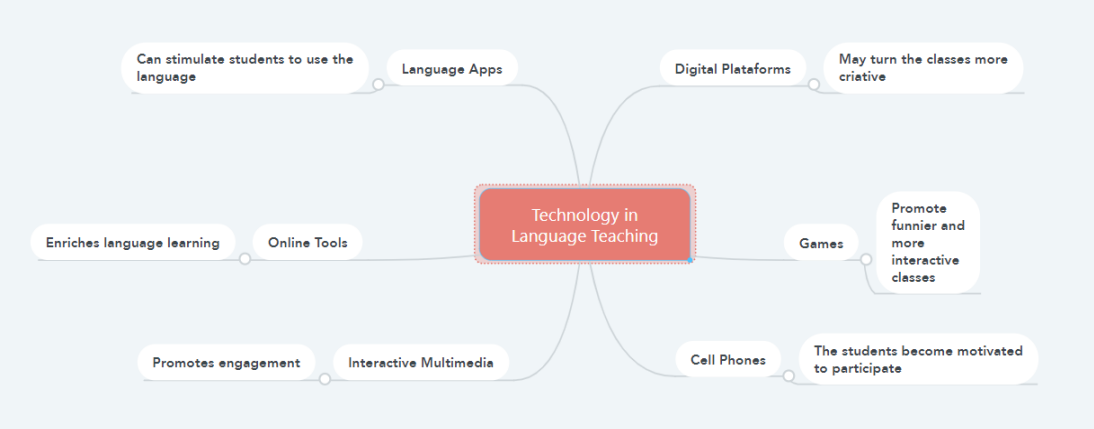
Source: the author

When Barbara states, for example, that *“there are many tools to teach English using technology”* and proceeds to mention only digital tools (“*websites, games, Power Point”*), it shows an understanding of Technology that comes from

everyday experiences with digital platforms, not from previously acquired scientific knowledge. Within the scientific field of language teaching, Technology is understood in a more complex way, englobing other human inventions and developments as technological tools as well, such as writing, for instance.

Isa's Mind Map is another example of the same understanding of Technology, and it is very similar to Barbara's.

Figure 10 – Mind Mapping Technology - Isa

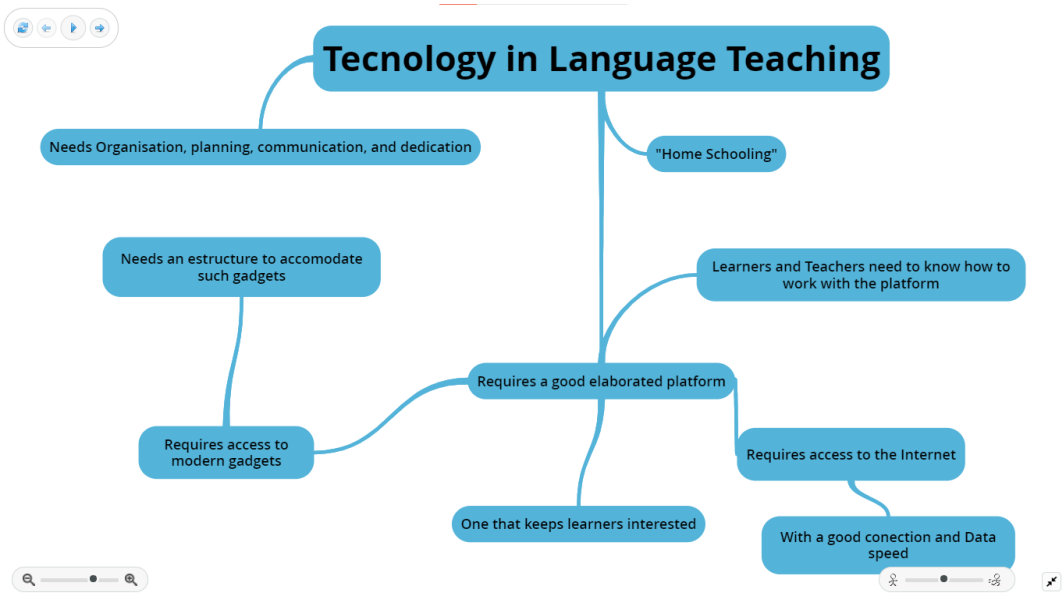


Source: the author

Much like Barbara, Isa's Mind Map displays a representation of Technology that is not based on scientific knowledge, but seems to draw on personal experience. She only mentions digital tools ("*digital platforms"; "language apps"; "online tools"; "cell phones" etc.*) and the connections she establishes to what those tools can do seem to be based on personal experiences she's had with those (regardless if as a student or a teacher), which is clear when she writes, for instance that *"digital platforms may turn the classes more creative"* or that with the use of cellphones *"the students become motivated to participate"* .

Philip's mind map is another example of a representation of Technology that is based primarily on the pre-service teacher's experience with it.

Figure 11 – Mind Mapping Technology - Philipp



Source: the author

Philip, at this point, also only understands Technology as a set of digital tools: *"modern gadgets"*, *"a good elaborated platform"*, *"access to the Internet"* etc.

It is also interesting to notice that neither one of these pre-service teachers used the linking verbs according to the instruction we gave for this activity. Most of the connections they displayed are understandable without the verbs, but in some moments certain things get a little foggy. For example, when Philip mentions *"home schooling"*, it is difficult to understand what he means, especially considering that home schooling is not legal in Brazil. He could be using the expression to refer to the emergency remote learning situation we were going through, or he could be using it to refer to remote learning in general – it is not possible to know, however, without further explanation from him.

This is why Sforni (2015) and the social-historical-cultural scholars put so much emphasizes in language and verbal expression – because language and verbal expression allows us to peek inside the learner's mind and assess how they are mentally operating with the concepts being taught (SFORNI, 2015).

What we can see here, tough, is that, at this moment, the pre-service teachers' were not mentally operating with the concept of technology based on scientific knowledge (SFORNI, 2015).

The analysis of the processes of Digital Literacy within the activities starts on the following class (which is also the official starting point of the course),

since, at this point, we had not yet gone through the first one of them - “Statement: To state clearly the problem to be solved or task to be achieved and the actions likely to be required” (MARTIN & GRUDZIECKI, 2006, p. 259) - so they had not yet effectively begun.

August 20th

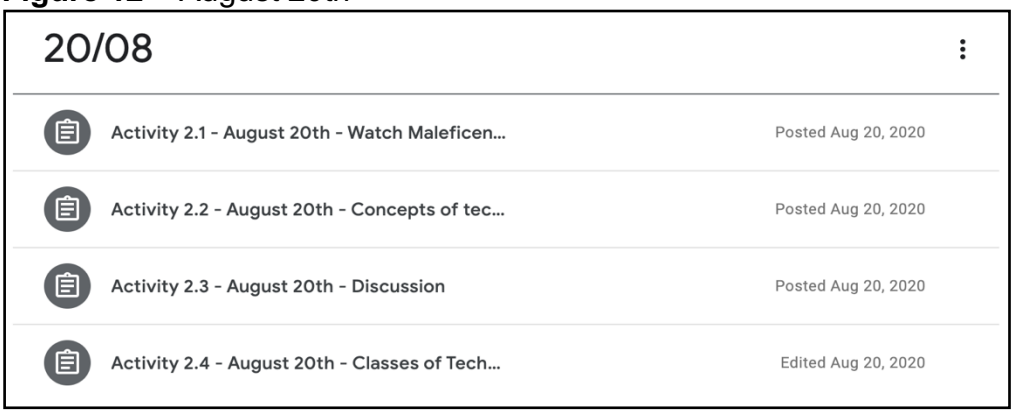
The following class, on August 20th, was the first synchronous class of the course, which happened online through Google Meet. We also relied on Google Forms and a few other tech tools to carry out the activities.

The activities elaborated for this class were still guided by Principle 01: Teaching that Promotes Development.

At this point of the FDE, we had established, through the analysis of the minds maps that were handed in for the previous class, what the current level of development of our group regarding Technology was: most of their understanding of it came from personal experiences, not from scientific knowledge. So, the next level of development would be to guide the pre-service teachers towards understanding Technology from a scientific perspective, and, consequently, broadening their understanding of it.

There is a sum of 4 activities registered on Google Classroom on this day, which were done throughout the class. Even though it was a synchronous class, we posted the instructions for the activities that would be carried out on Google Classroom as well.

Figure 12 – August 20th[34]



[34] We used a continuous system to number the activities on Google Classroom, to avoid any confusion. Students had an asynchronous class before this one, which is why the activities are numbered “2.1”, “2.2” etc.

Source: the author

Before we began the listed activities, we had a conversation with the enrolled pre-service teachers regarding the general structure of the course. We presented ourselves, the syllabus, and the research we would be doing, giving them a general idea of what the FDE stood for. We also took some time to present and explain the Magazine Issue project and how it would unfold throughout the course.

This initial explanation is an important part of the FDE. Silva (2014, p. 65) mentions:

> "The formation of mental actions happens in three stages, which were well studied by Galperin (2001): the instruction, the execution and the control of the process. The instruction is the stage that directs the action, and it corresponds to the explanation of the proposed task and the conditions available for it to be executed; for that to happen, learners must be aware of the activity […]. The instruction is not definite or finished; it is a continuous moment, which happens throughout the activity.[35]

Furthermore, we can identify, during this moment, the first process of Digital Literacy pointed by Martin & Grudziecki (2006): statement.

The chart below presents the definition of this process and an excerpt from the class' recording transcript that correspond to it.

Chart 7 – Digital Literacy Processes on August 20th

Process (MARTIN & GRUDZIECKI, 2006)	Descriptor (MARTIN & GRUDZIECKI, 2006)	Transcript
statement	To state clearly the problem to be solved or task to be achieved and the actions likely to be required	*"Denise: […] A nossa ideia é - I'm going to switch to Portuguese just to coment on the course program - é que a gente faça uma atividade social, que é uma produção de*

[35] Originally, "A formação das ações mentais transcorre em três etapas que foram bem estudadas por Galperin (2001): a orientação, a execução e o controle do processo. A orientação é a etapa que direciona a ação, corresponde à explicação da tarefa proposta, da explanação das condições em que a tarefa tem para ser executada, para isso os alunos precisam estar cientes da atividade [...]. A orientação não é definitiva, acabada, ela é um momento contínuo, acontece durante toda a atividade "

		revista sobre tecnologia, e ao fazer essa produção de revista, a gente acredita que a gente vai dar conta desses conteúdos todos aqui. Então falar sobre tecnologia e ensino de línguas, letramento digital, essas experiências de desenvolvimento de letramento digital no ensino de línguas, affordances e ferramentas de publicação digital."

Source: the author.

As the chart above demonstrates, this is the moment the processes of digital literacy (MARTIN & GRUDZIECKI, 2006) are first set into motion, starting with the first one (statement). Professor Denise states clearly the task to be completed (the creation and publication of a magazine) and the actions likely to be required (the topics that should be studied and discussed in order to develop the magazine). Authors Martin & Grudziecki (2006) consider this process (statement) to be the first one, the one that kickstarts all of the other ones[36] (see Figure 3).

On activity 2.1, the pre-service teachers were asked to watch a two-minute video, which displayed the trailer for Disney's Maleficent (2019) movie, and as they watched, they should try to find the connection between the story and the topic of our class, which was technology.

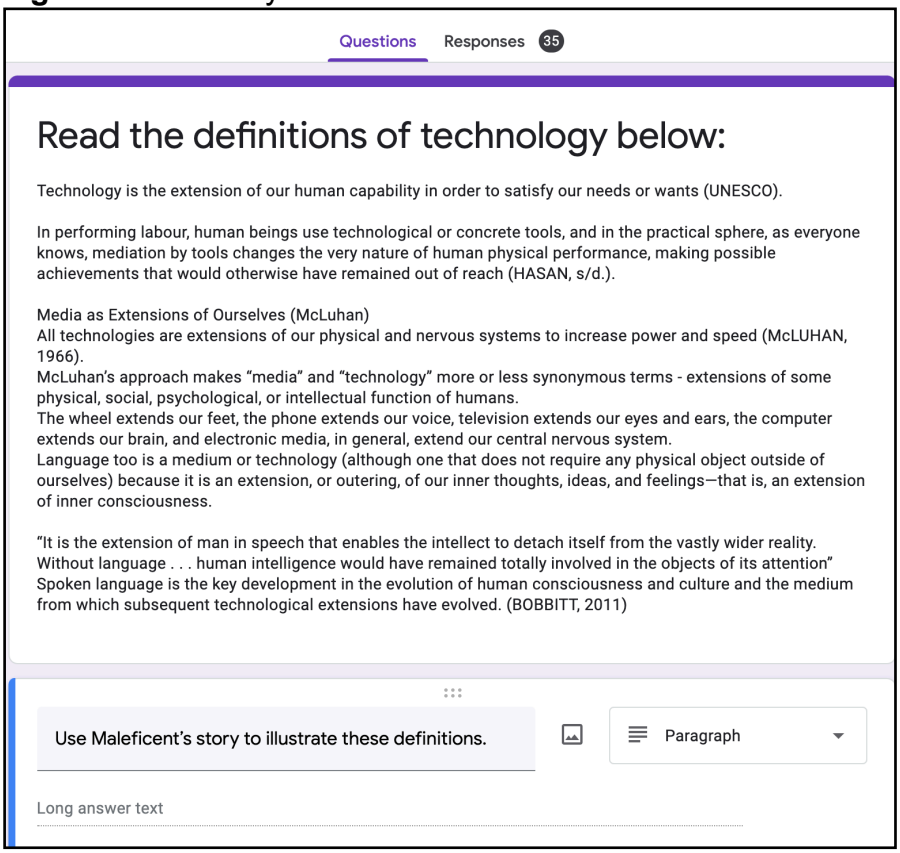
On activity 2.2, they found a Google Form, in which there was an input text and then a question. The instructions asked them to read a few definitions of technology (presented in the text) and then, at the question section, illustrate these definitions by using Maleficent's story.

[36] It is important to note that the authors understand these processes to be *more or less* linear, so there might be some variation in the order that they appear from this class onwards.

This movement of identifying general principles of a concept (Technology, in this case) from a particular situation is referred to as generalization (DAVIDOV, 1988) and it is at the very core of the development of scientific concepts.

Through a metaphorical analysis of Maleficent's story, we were aiming at having the pre-service teachers go through this generalization process that would lead to the concepts presented in Activity 2.2, thus developing their theoretical thought (LURIA, 1994; VIGOTSKI, 2001).

Figure 13 – Activity 2.2

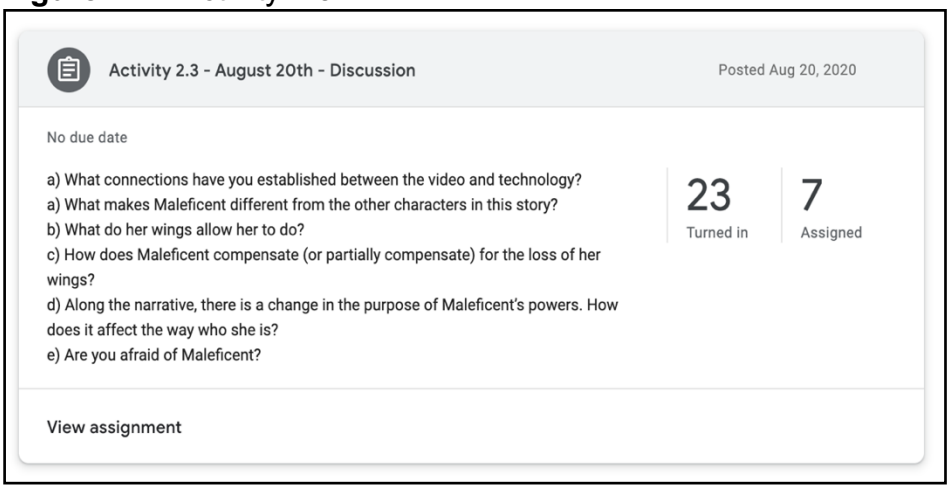


Source: the author

On Activity 2.3, we listed six guiding questions [37]for a follow-up discussion on the video of the previous activity.

[37] Even though these questions do not explicitly put the concept of technology as the focus of the discussion, they were built to lead to that, since we planned a live, guided discussion, as opposed to a written or asynchronous one, in which case these questions might not have worked that well. Also, it is important to notice that these questions aimed to discuss the concepts presented on Activity 2.2 but also expand on them, analyzing other issues and questions related to the concept of technology.

Figure 14 – Activity 2.3



Source: the author

Lastly, on Activity 2.4, we proposed an activity which required the pre-service teachers to connect a list of different kinds of technology (objects, knowledge, activities etc) to the corresponding example located in a second list (courses in Google Classroom, VR Glasses, Flipped classroom) etc.

As previously mentioned, one of the suggested teacher actions for Principle 01: Teaching that Promotes Development is to pay attention to what the learner's express verbally, which will show how they are mentally operating with the concept. This is why so many of the activities planned for this class involve discussions.

When we ask, for example, that the pre-service teachers try and figure out what was the connection between the trailer and Technology on activity 2.1 *before* we present the scientific concepts we believed it could be linked to, we created a moment in which they could verbally express their understanding of Technology. This was also a moment for us to confirm if our assessment, based on the Mind Maps, was correct. Furthermore, these activities would fall under the category of what Sforni (2015) understands as an "analyze" kind of activity. According to the author, these kinds of activities have the greatest potential to foster learning and development, exactly because they demand that students actively engage with the concepts and verbally express how they are mentally acting with it.

A more detailed analysis of this sequence of activities further confirmed that, at this point, the pre-service teachers were mentally operating with Technology as an everyday concept. This analysis is highlighted in a teaching episode that happened during the this very class (August 20th), which are presented in the following paragraphs.

The excerpts below demonstrate the referred teaching episode from the August 20th class with the afternoon group:[38]

Chart 8 – Teaching Episode 01, part 01

"Denise: [...] And now let's move on to our first activity. Maria Paula, can you help me with this activity?

Maria Paula: Yes, of course. Guys, we are going to actually start talking a little bit more about technology now, and for us to start, we would like to ask you to go to Google Classroom and watch the video that Denise has posted there. It's a video about Maleficent, I don't know how many of you have watched the movie, probably heard the story, so I will give you a few minutes to watch and then come back here so that we can talk a little bit about it.

Denise: And try to figure out the relationship, the connection between this video and technology.

Maria Paula: While you watch it, try to imagine why we asked you to watch it. Do you think three minutes is enough? Yes? Okay. […] So some people have already watched it. Is that everyone, guys? […] Okay, I think everyone has watched it. If you are still watching, that's okay, once you are done, just mark as concluded and join us here in the discussion. For those of you who have already watched, do you have any ideas regarding the connection between the video and our discussion here about technology? Do you have any guesses? [redacted] *". Anyone?*

Nathalie: I think maybe it's like one way of bringing technology to the classroom, through media such as this trailer.

Maria Paula: Okay. Anyone else?

[redacted]

Tati: I agree with [redacted]*. I think this is a very old story, but it's remade with the use of technology and the result is incredible."*

Maria Paula: Any other guesses?

[38]The Teaching Episode was broken into two parts for the purpose of the analysis, but we understand that both excerpts represent one complete Teaching Episode that demonstrates how, at this point, the pre-service teachers were mentally operating with Technology as an everyday concept..

[39] Some of the sentences and lines from this transcript were blocked because they refer to or were uttered by a pre-service teacher that did not agree to participate in the research.

Philipp: Maybe, in the beginning, I think technology can be seen as an unknown figure, tipo um impostor, because when Malifect arrives, she is dark, she is chaos, and with the familiarity, you discover that sometimes it's not that, you just need to learn, let me say.

Maria Paula: Very interesting. Anyone else, guys? Any other guesses? Somebody said in the chat the CGI, Cecília said the CGI, so it's the technology they use to create beings that are not real or parts of beings that are not real. Anyone else would like to say something about it?"

Teaching episode 01: Reflecting on Maleficent's story

When Nathalie explains the connection she could establish between the trailer and the concept of Technology, it is clear that she is drawing from previous experiences she had, whether as a teacher or a student, it is not quite clear, of *"bringing technology to the classroom through media such as this trailer"*. Therefore, her representation of Technology, at this moment, can be defined as an everyday/spontaneous concept.

The same thing can be identified in Tati's and Cecília's speech. It is implied that Tati is familiar with these stories - the "original" fairy tale and the movie "Maleficent" – and she's seen the difference technology made between the two versions. Cecília follows a similar line of thought, pointing towards the technology that was necessary to create the movie.

Philipp is the one who comes closest to the movement of generalization that we aimed at, but even so, it seems to be implied that he has experienced (whether as a witness or lived it himself) a certain discomfort regarding Technology at first, and he is able to relate that to the elements of the story. Nonetheless, nothing in his speech indicates that this association is based on scientific knowledge.

All of these pre-service teachers' representations of Technology come from their particular experiences with it, even when those that took place in an academic environment (like the classroom Nathalie was referring to), the concept itself is not scientific – it is an everyday concept.

In the next part of the excerpt, we interfere, pointing the pre-service teachers towards the direction we'd hope the discussion would go – that is, we were working within the ZPD (VIGOTSKI, 1978).

Chart 9 – Teaching Episode 01, part 02

"Denise: Maybe following the same metaphorical line of thoughts that Philipp did. A more metaphorical interpretation of what technology is. What we can do with technology.

Maria Paula: No, no one else?

Denise: Because what we had in mind is to, although we anticipated that you could of the technology use before introducing the movie, the trailer, we were more interested in discussing it in a metaphorical way, so how could Maleficent represent technology, or her powers, her body and so on.

[redacted]

Maria Paula: Can you see any other representations of technology within the movie? Maybe something else that Maleficent has or uses that could also represent technology.

Luis Henrique: I could relate actually also because I've seen the questions that you provided us. When she lost her wings, she uses that piece of wood that helped her walk or something, so technology being a support. I could relate to that, I don't if it's correct."

Teaching episode 01:Reflecting on Maleficent's story

Luis is referring to activities 2.2 and 2.3 when he says, "because I've seen the questions that you provided us". When he states that he was able to establish this connection, which was not yet the concept of Technology, but slightly gearing towards it, because he peaked at the questions and activities provided, he is implying that, without that guidance, he would not have been able to do it. In other words, it further confirms that we were acting within the Zone of Proximal Development of our group.

This is also confirmed by most of the answers registered on Google Forms for Activity 2.2. After our interference (both verbally and through the activities that followed as well), most of the pre-service teachers were able to grasp general principles of the concept of Technology from the trailer presented. This is an indication

that, through these activities, the concept of Technology began to be developed, as shown in the excerpt below[40]:

Chart 10 – Developing the concept of Technology

"Technology is not strictly related with the digital, but any kind of tools. A wheel, a computer, a windmill, they all are technologies. It doesn't need to be physical also, like writing. In the movie, there is a gap of technology between Maleficent and the rest of the characters - about warfare technology for example, the characters rely on swords and horses, while maleficent can cast curses. Magic is a technology that Maleficent uses in her advantage - which she mediates through language."

Source: Activity 2.2 (anonymous questionnaire answer)

As previously mentioned, a scientific concept does not stand alone, but is instead inserted in a complex system of associations (LURIA, 1994). Understanding a variety of tools as Technology is only one of those associations within the concept, but it is one the pre-service teachers had not mentioned before the intervention and instruction.

The chart below shows a few more examples of answers and the associations they were establishing with scientific concepts:

Chart 11 – Concepts of Technology

Excerpt (Anonymous answers)	**Concept**
"These definitions can be easily related to Maleficent's story, because her powers are an extension of herself; as technology is an extension of humans capacity. When she lost her wings, she used a piece of wood in order to learn how to walk again, to help her walk. That's what technologies do to us, it is something that help us, something that will extend our capacity."	Technology is the extension of our human capability in order to satisfy our needs or wants (UNESCO).

[40] The answers to this activity were anonymous.

"Maleficent has a tragic story of losing her wings and using her powers and scepter as an extension of herself and as a tool to satisfy her necessities and wants, although she can only use those tools through language. So, the technology present here is through the language she uses to achieve what she needs or wants."	"It is the extension of man in speech that enables the intellect to detach itself from the vastly wider reality. Without language . . . human intelligence would have remained totally involved in the objects of its attention" Spoken language is the key development in the evolution of human consciousness and culture and the medium from which subsequent technological extensions have evolved. (BOBBITT, 2011)
"She uses her powers to extend her reach and do marvelous things. She achieves much more using her magic, that can be viewed as tools, the same way that we are now, using the internet and the available tools to overcome the issues being faced in our time."	In performing labour, human beings use technological or concrete tools, and in the practical sphere, as everyone knows, mediation by tools changes the very nature of human physical performance, making possible achievements that would otherwise have remained out of reach (HASAN, s/d.).

Source: Activity 2.2 (anonymous questionnaire answers)

As we can see, the pre-service teachers start to interpret technology associated to several definitions brought by the literature. To us, the answers presented here are the beginning of their movement of mentally operating with Technology as a scientific concept. The third example shown in the chart above indicates that this pre-service teacher in particular was not only able to relate the concepts presented to the movie trailer but also to the reality that they were living through during the time that this research took place – the coronavirus pandemic and the subsequent remote learning context. This movement is the generalization Luria (1994) talked about it, and it points towards the development of a scientific concept (here at a beginning stage).

However, not all of the answers were similar to these. Some were still reflecting everyday concepts only, like the examples below:

Chart 12 – Technology (still) as an everyday concept

"Technology has the power to create things we could never imagine that some day would exist, like the movie Maleficent."
"I believe that Maleficent's emotions are enhanced with the use of technology."

Source: Answer from questionnaire (anonymous)

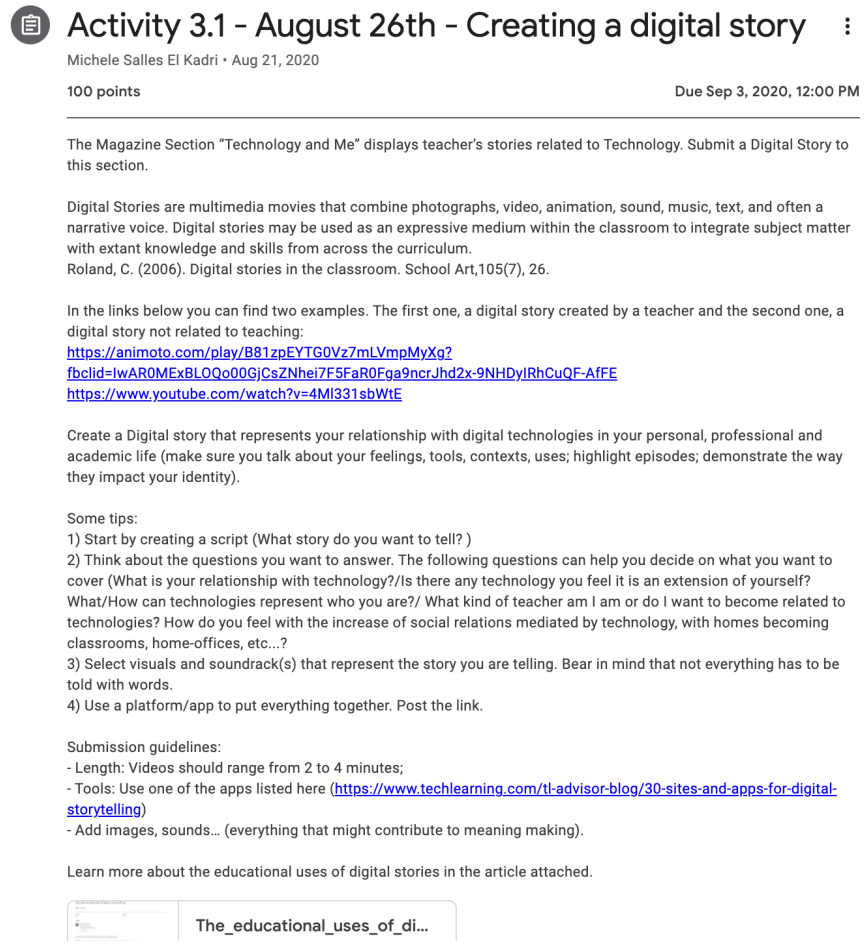
These answers reaffirm the need pointed by Sforni (2015) to separate a moment during the Experiment to seek the core of the concept (Principle 05) and bring the learner's focus back to the scientific concept itself (Principle 03). Because we had structured the course around the Formative Didactic Experiment from the beginning, we had already scheduled a moment for that, which was the second half of the work with the concept of Technology, that is, the classes from the 10th to the 24th of September.

But before that, there was an asynchronous class, which took place on August 26th.

August 26th

The assignment for this class was to create a Digital Story that illustrated the pre-service teacher's personal relationship with technology, in whatever aspect of their lives they felt comfortable sharing.

Figure 15 – August 26th



Activity 3.1 - August 26th - Creating a digital story

Michele Salles El Kadri • Aug 21, 2020

100 points — Due Sep 3, 2020, 12:00 PM

The Magazine Section "Technology and Me" displays teacher's stories related to Technology. Submit a Digital Story to this section.

Digital Stories are multimedia movies that combine photographs, video, animation, sound, music, text, and often a narrative voice. Digital stories may be used as an expressive medium within the classroom to integrate subject matter with extant knowledge and skills from across the curriculum.
Roland, C. (2006). Digital stories in the classroom. School Art,105(7), 26.

In the links below you can find two examples. The first one, a digital story created by a teacher and the second one, a digital story not related to teaching:
https://animoto.com/play/B81zpEYTG0Vz7mLVmpMyXg?fbclid=IwAR0MExBLOQo00GjCsZNhei7F5FaR0Fga9ncrJhd2x-9NHDyIRhCuQF-AfFE
https://www.youtube.com/watch?v=4Ml331sbWtE

Create a Digital story that represents your relationship with digital technologies in your personal, professional and academic life (make sure you talk about your feelings, tools, contexts, uses; highlight episodes; demonstrate the way they impact your identity).

Some tips:
1) Start by creating a script (What story do you want to tell?)
2) Think about the questions you want to answer. The following questions can help you decide on what you want to cover (What is your relationship with technology?/Is there any technology you feel it is an extension of yourself? What/How can technologies represent who you are?/ What kind of teacher am I am or do I want to become related to technologies? How do you feel with the increase of social relations mediated by technology, with homes becoming classrooms, home-offices, etc...?
3) Select visuals and soundrack(s) that represent the story you are telling. Bear in mind that not everything has to be told with words.
4) Use a platform/app to put everything together. Post the link.

Submission guidelines:
- Length: Videos should range from 2 to 4 minutes;
- Tools: Use one of the apps listed here (https://www.techlearning.com/tl-advisor-blog/30-sites-and-apps-for-digital-storytelling)
- Add images, sounds... (everything that might contribute to meaning making).

Learn more about the educational uses of digital stories in the article attached.

The_educational_uses_of_di...

Source: the author

As indicated by Figure 15, the Digital Story was part of the designing process of the first section of the Magazine, which was called "Technology and Me". Even though the issue would be produced in groups, we asked the pre-service teachers to do this activity individually so each one could have the chance to operate with their narrative on technology.

The principle that guided the elaboration of this activity was Principle 02: of The Active Character of Learning. Besides advocating against teacher-centered approaches and instead putting the learner as the central and active part of the learning process, this principle highlights the importance of re-creating the need and motives to develop the scientific concepts that are being taught. In other words, learners are more likely to learn when there is a clear and meaningful reason why they should (LIZZI, 2020).

This is what Sforni (2015, p. 387) translates into one of the suggested teacher actions for Principle 02, which suggests the "incorporation of problem-solving situations that allow the student to be inserted in the investigative horizon that first

originated the concept". By having students reflect on their personal relationships with technology, in other words, the role it played in the many different areas of their lives, we were aiming at highlighting the need and motive to develop the scientific concept of Technology (which is also the reason why we asked them to do this individually).

The Digital Story should reflect their relationship with technology in every and any areas of their lives they felt comfortable sharing: personal, professional, and academic. We also encouraged them to mention tools they've used, how they feel about technology and its role in their everyday life, how it affects who they are, etc.

We provided a few samples of Digital Stories as well as mentioned some tech resources we thought might be helpful, but we gave them the freedom to choose whatever editing system they preferred.

We also provided a simple step-by-step guide (a script, so to speak) to help them structure their digital story in a coherent way, as well as for them to have a better idea of what we were expecting. Once again, this detailed instruction is an important step during a Formative Didactic Experiment, because it directs the (learner's) action away or towards the goal of the activity – the next level of development (SILVA, 2014; SFORNI, 2015).

This activity can also be classified as an "analyze" kind of activity (SFORNI, 2015), because it demanded the pre-service teachers' to reflect on and find a way to express their relationship with technology. These are the types of activities Sforni (2015) considers to be the ones that most hold potential to promote learning and development, which is why we chose it.

Within this activity, it is possible to identify three processes of Digital Literacy (MARTIN & GRUDZIECKI, 2006): identification, accession, and creation.

Identification and accession are the processes that require a learner to "identify the digital resources required to solve a problem or achieve successful completion of a task" and "to locate and obtain the required digital resources" (MARTIN & GRUDZIECKI, 2006, p. 257). The creation process involves the creation of "new knowledge objects, units of information, media products or other digital outputs which will contribute to task achievement or problem solution" (MARTIN & GRUDZIECKI, 2006, p. 257).

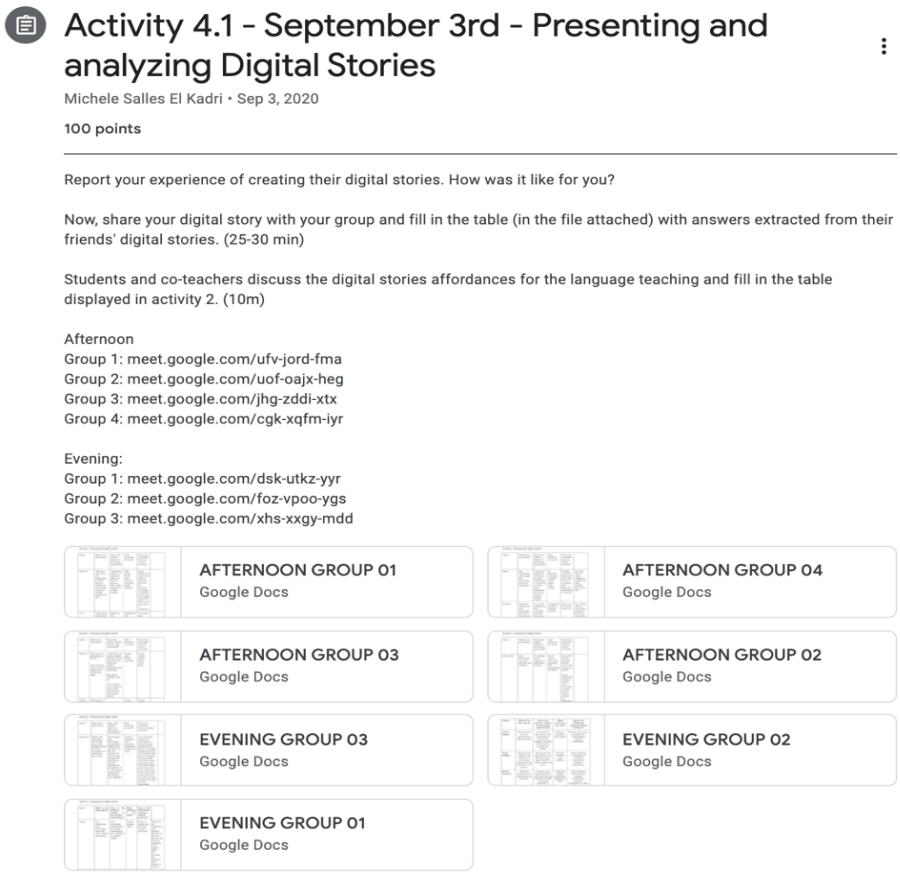
This activity required the pre-service teachers to go through all three of the mentioned processes: they had to identify and access the digital resources that would be necessary to create their Digital Story. The pre-service teachers comment

on these processes on the transcript of the following meeting, during the presentation of the Digital Stories, which happened on September 3rd.

September 3rd

On the following class, on September 3rd, which was a synchronous class, we asked the pre-service teachers to form groups and refer to their Digital Stories. We explained that in these small groups, we were going to watch each of the digital stories and hold a discussion afterwards.

Figure 16: September 3rd



Source: the author

We asked the pre-service teachers to get together in no more than four groups so that each group would have one of us (me, my fellow researcher, or one of the two professors responsible for the course) guiding them through the conversation about their Digital Stories and the experience of producing them.

We had four groups during the afternoon class; they remained the same until the final class of the course, and their members produced the Magazine issue together, which they begun doing during this class.[41]

For the first part of the activity, each group discussed the process of creating the Digital Story. Within the groups, the pre-service teachers shared their impressions of this creative process: how easy or difficult it was, what were the main challenges etc.

This discussion activity was important because it allowed us to understand the pre-service teachers' relationship to technology in a deeper level then we would have if we had only watched their Digital Stories. By having them comment on the creative process and they went through, we followed Sforni's (2015) Principle 01: Teaching that Promotes Development again, by "creating situations in which students verbally express what and how they are thinking (how they are interacting mentally with the concepts)"(SFORNI, 2015, p. 385).

It was through their verbal expressions that we were able to identify the previously mentioned processes of Digital Literacy that were set into motion through this activity: identification, accession, and creation.

Below, I bring examples of excerpts from the transcript of the group I was accompanying that afternoon in which these processes are identifiable.

The excerpts are color coded: in yellow, I highlighted the parts which indicate the identification process; in blue, the parts that indicate the accession process, and finally in green, those that refer to the creation process.

Gabrieli was the first to share her experience.

Chart 13 – Gabrieli talks about her Digital Story

Gabrieli: For me it was confusing in the beginning because I didn't know how to... so, as I was saying, it was confusing at first, because I didn't know what images to put, what to say, and mainly the part of editing the video, because I don't know how to do it, so it was confusing. So, it took like a day, a whole night to do it, but at the end, it was ok, of course it wasn't that good of a video, but it worked.
Maria: So, the hardest part was deciding what to insert and then the editing part for you? What platform did you end up using?

[41] There was actually a misunderstanding at some point, which we only realized later on, and it turned out that by the end of the course we had 5 groups. On this class, however, they were still only 4.

Gabrieli: I used Sony Vegas to edit the video.

Source: Class recordings' transcript from September 3rd.

Luis Henrique was the next pre-service teacher to speak.

Chart 14 – Luis Henrique talks about his Digital Story

Luis: For me it was a little bit hard, I don't know how to edit videos, so I just recorded, I did the part once, and I recorded on PowerPoint, and then I saved the video, because I don't know how to edit videos and something like that. I didn't put a song or something like that, it's just me talking and showing the images in the PowerPoint.

[…]

Maria: Do you think that for you it was also hard to decide what to talk about in the digital story? Like, the content itself, or just the editing?

Luis: It was a little, not too much. But it was ok, to talk about that, because I always loved technology, but I try to be smooth with it. It was ok.

Source: Class recordings' transcript from September 3rd.

Cecília was the next pre-service teacher to share her experience.

Chart 15 – Cecília talks about her Digital Story

Cecília: I was confused a little at start, as to what should I put, so I followed the questions that you guys put there, so that I could relate it to technology. I wrote a script before, because I was confused, I tend to ramble a lot, so I thought, my video is going to be too much. But once I started I think it went well. The editing, I was confused too, it took me a little to add everything, like the sound and the PowerPoint, but I think it was ok.

Maria: Did you use PowerPoint as well?

Cecília: I used Canva to put the slides together, then I used iMovie to put the video together.

Source: Class recordings' transcript from September 3rd.

The last pre-service teacher to speak was Anna.[42]

Chart 16 – Anna talks about her Digital Story

Anna: I struggled with the tools that I had to use, because I tried to use the ones that the professors told us to do, they were on that list, and it was really difficult because most of them were not free or they weren't to Android, it was only for the iOS. It was really hard to find a tool, then I found one, then I couldn't make a video of it. Then I tried... I can't remember the site I used, then I could insert audios, but it wasn't a video anyways, then I tried PowerPoint, and then I finally could make a video, but I struggled a lot.

Maria: What platform did you end up using, do you remember?

Anna: I think I used images that I found, I think the name of the site was Image Forest, so I took the images from there, and then I inserted them into the PowerPoint.

Maria: […] What do you think was harder, the technological aspect of it or everything?

Anna: I don't know because as it was something more personal, like our relation with technology, I don't think it was that difficult. It was just hard to find a sequence for it. But I don't think it was hard to find.

Source: Class recordings' transcript from September 3rd.

As the charts above demonstrate, all three processes are identifiable through the pre-service teachers' speech, and each of them are connected to a different stage of the creation of the Digital Story. The identification process can be seen when the pre-service teachers are explaining how they chose a digital tool to develop the task given to them. The accession process is seen when they are talking about the process of obtaining access to this tool, which could mean creating an account in a digital platform, downloading an app etc – whatever they had to do to be able to use the chosen tool. Finally, the creation process is seen when they are talking about actually using the tool and creating their Digital Stories.

[42] There was one other pre-service teacher on this group who did not agree to participate in the research, so their contributions are not analyzed here.

For the second part of the activity, we watched and analyzed the Digital Stories of each member of the group. In order to do that, we provided each group with two charts.

The first chart had guideline questions that the pre-service teachers should answer as they watched and discussed their own and their colleagues' Digital Stories. This activity was done through Google Docs. We created one document per group (which contained the chart) and shared it with all the participants, so that everyone could edit at the same time and fill out the chart together.

The chart is illustrated below (they were the same for all the groups):

Chart 17 – Guideline Questions (Chart 1)

- Author:	(Name)	(Name)
- What is the story about?		
- How is the authors' relation to technology presented?		
- What resources are used?		
- How is the multimodal meaning making achieved?		

Source: Activity 4.1

The second chart contained guideline questions for the group to reflect on the Digital Stories as a tool for language teaching. The chart is illustrated below (it was also the same for every group).

Chart 18 – Guideline Questions (Chart 2)

Digital stories provide opportunities to...	
What skills and abilities are required?	
What are the demands and restrictions?	
What are the attractions and rejections?	

Source: Activity 4.1

This second part of Activity 4.1 also set into motion three other processes of Digital Literacy as well: evaluation, interpretation, and analysis.

According to authors Martin & Grudziecki (2006), interpretation means "To understand the meaning conveyed by a digital resource" (MARTIN & GRUDZIECKI, 2006, p. 257). This is what the first chart demanded the pre-service teachers to do – understand the meaning of each Digital Story presented, specially by reflecting on the last question ("how is the multimodal meaning making achieved?").

The second chart involved the processes of evaluation and analysis. Evaluation means "to assess the objectivity, accuracy and reliability of digital resources and their relevance to the problem or task" (MARTIN & GRUDZIECKI, 2006, p. 257), and analysis means "to examine digital resources using concepts and models which will enable solution of the problem or successful achievement of the task" (MARTIN & GRUDZIECKI, 2006, p. 257). The pre-service teachers went through both of these processes as they answered the questions on the second chart, reflecting on the "objectivity, accuracy and reliability" of using this particular digital resource (Digital Story) for the teaching of languages.

Going back to Sforni's principles, the work with these two charts also refers back to Principle 02: The Active Character of Learning, because it created a moment in which the pre-service teachers were reflecting on the use of a specific digital resource (in this case, Digital Story as well as the tools necessary to create it) for language teaching and learning. In other words, it allowed them "to be inserted in the investigative horizon that first originated the concept" (SFORNI, 2015, p. 387).

On the following section, we move on to the next phase of the FDE, which focused more on the other three of Sforni's (2015) principles.

4.1.1 The Conscious Character of The Activity, The Unity Between the Material and Verbal Spheres & Action Mediated through Concept

The next phase of our Formative Didactic Experiment continued focused the concept of Technology, but with a different take. After these first four classes, we had the necessary data to assess the actual developmental level of the group.

As previously stated, in the very beginning of the course, the pre-service teachers were mentally operating with a spontaneous or everyday concept of technology, not a scientific one. Therefore, the activities we designed from that moment on aimed at working within the Zone of Proximal Development, having the level of potential development (in this case, the development of the scientific concept) as its main goal.

In order to do that, on the following three classes, we were mostly guided by the other three principles Sforni (2015) establishes, summarized in the chart below:

Chart 19 – September 10th to October 1st

Date	**Class/Assignment Description**	**FDE Principle 03: The Conscious Character of The Activity**	**FDE Principle 04: The Unity between the Material and Verbal Spheres**	**FDE Principle 05: Action Mediated through Concept**
10/09	Asynchronous Class Assignment: create a timeline with the history of technology in language teaching.	a) elaboration of activities that have the potential to promote action with the concept; b) prediction of mental actions so that the central content of the activity is the focus of the students' conscience; c) attention to the students' verbal explanations, which indicate whether they are establishing a relationship between	"a) organization of activities that promote interaction between the material or materialized level (illustrative) and verbal language (spoken and written). b) use of scientific and classic texts from the respective field of knowledge." (SFORNI, 2015, p. 390).	a) Analysis of the genesis of the concept in its logical-historical aspect to seek what is the core of the concept b) Elaboration of problem-solving situations, which require students to mediate the concept c) Inclusion of new learning problems at the
17/09	Synchronous Class Assignment: present the timeline created.			
24/09	Asynchronous Class. Assignment: reflecting, re-visiting and complementing the timelines.			

01/10	Synchronous Class Assignment: Guided self-evaluation	the particular and the general.” (SFORNI, 2015, p. 389)		end of the study process to analyze whether students operate mentally with the concepts” (SFORNI, 2015, p. 392).

Source: the author.

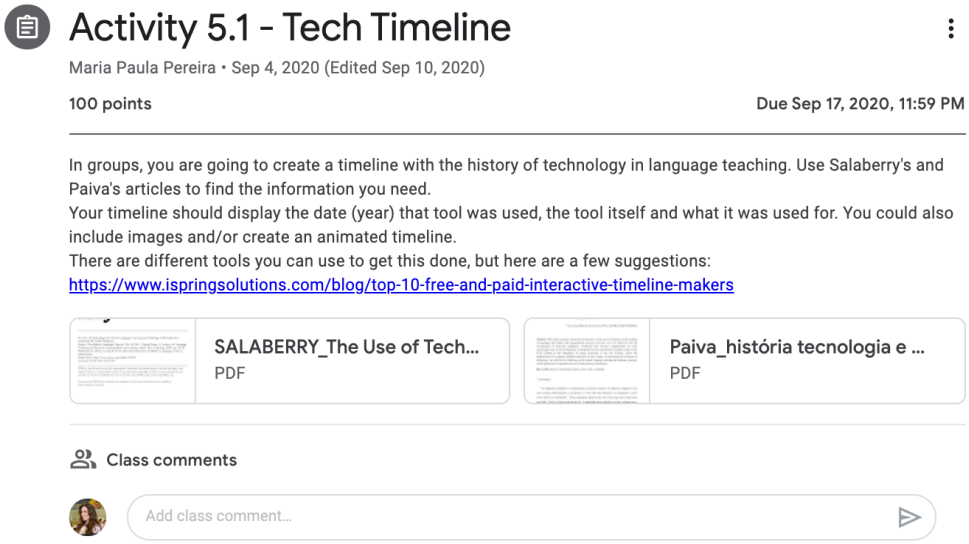
As we can see on previous chart, the activities designed in the course were meant to be the didactic transposition of these three principles. On September 10th, which was an asynchronous class, the pre-service teachers were assigned with the creation of a timeline displaying the history of Technology within language teaching. The synchronous class of September 17th was dedicated to the presentation of this timeline. The activities assigned for the asynchronous September 24th class demanded that the pre-service teachers reflected on and complemented their timelines, for reasons that will be shown next.

Now, I present and analyze, chronologically, each one of these activities.

September 10th

For this asynchronous class, we asked the pre-service teachers to create something we referred to as a “tech timeline”.

Figure 17 – September 10th Activity 5.1



Source: the author

The timeline format was an idea inspired by one of the suggested teacher actions for Principle 05: Action Mediated through Concept, when the author suggests analyzing “the genesis of the concept in its logical-historical aspect to seek what is the core of the concept” (SFORNI, 2015, p. 392). Within this principle, Sforni (2015) highlights the importance of analyzing a concept in its historical aspect so as to understand what its core aspects are. This was our goal with this assignment: lead the pre-service teachers closer to the concept by guiding them through a historical analysis of it, seeking its core aspects.

The assignment was to create a timeline that illustrated the history of Technology in language teaching. This timeline would be featured in the next section of the magazine (one timeline per magazine issue), entitled “Learning from the Past”. That history and its details would be found in two scientific texts (SALABERRY, 2018 & PAIVA, s.d.) we provided along with the instruction for the activities. Both authors write a historical retrospective regarding Technology within language teaching, with slightly different focuses. Salaberry (2018) focuses more on digital tools, but with them, the author also presents the teaching perspectives that were implied; Paiva (s.d) also writes historically, but also includes technological tools that are not digital, such as writing and books.

Therefore, the information contained in both texts complement each other for a full understanding of the concept, and it also reaffirms that scientific concepts are not stand-alone truths, but rather complex systems of associations (LURIA, 1994).

As the previous stage of the Experiment showed, especially through the teaching episode analyzed above, the pre-service teachers were familiar with digital tools already.

By bringing scientific texts that relate these digital tools to teaching perspectives and historical contexts, as well as broaden the understanding of what technological tools are, and by asking the pre-service teachers to identify all of these associations within a timeline, we were working within the Zone of Proximal Development (they would not be able to do this without the instruction/guidance) in an attempt to transform an everyday concept into a scientific concept (SFORNI, 2015).

This activity should be done collaboratively (the same groups from the previous class), because here, we were not aiming at having the pre-service teachers reflect and establish particular-to-general relations individually; on the contrary, the Timeline, was designed to be a moment to promote action with the concept c*ollectively* (SFORNI, 2015).

In terms of structure, we specified that the timeline should display the year, the tool mostly used and how/what it was used for. The “how/what it was used for” is where we were expecting to work with the concept of Affordance, and from that, we were also expecting that the pre-service teachers would create a connection with the teaching/language perspective/principles to be pointed out by the groups. However, at first, this did not happen.

As we analyzed the timelines as they were being posted on Google Classroom during the week before the next synchronous class (September 17th), we noticed that the focus of the pre-service teachers’ consciousness during this assignment was the assignment itself, and not the concept (SFORNI, 2015).

In other words, their focus was solely on creating a timeline, which they all did beautifully. There was not, however, any indication that the students’ were further developing the scientific concept of Technology through creating new associations with other concepts (such as affordance and teaching perspectives) as we expected them to.

The figure below shows the first page of one of the timelines we received.

Figure 18 – Tech Timeline Sample 1

UNIVERSIDADE ESTADUAL DE LONDRINA

TECH TIMELINE

Bárbara
Izabella
Lais
Maria Luiza
Yasmin Zampieri

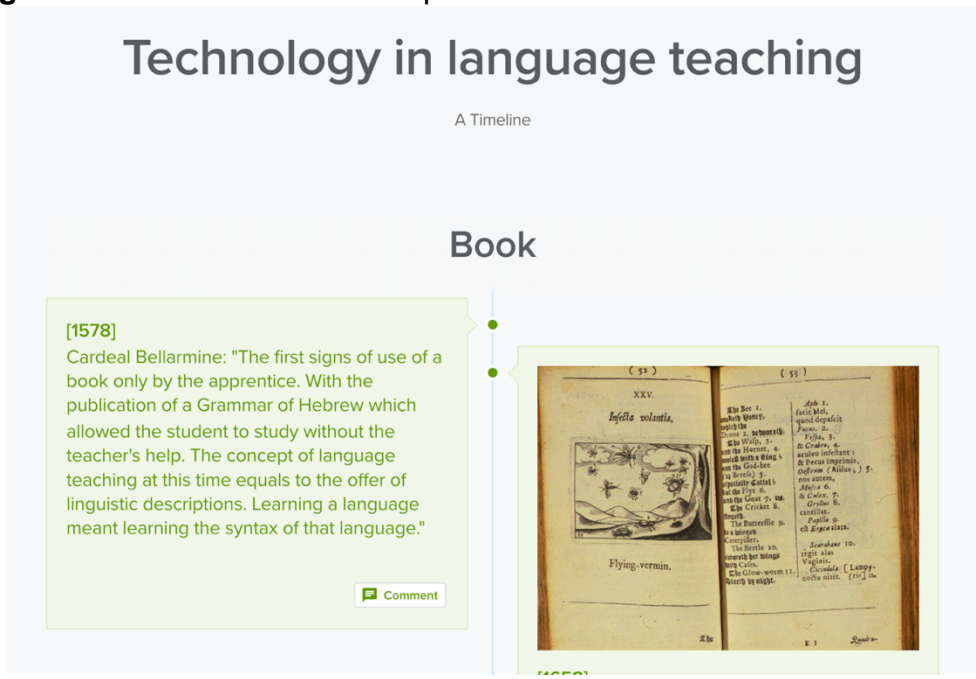
Year	*Tool*	*Use*
1578	Book	It made it possible for the students to study without the help from a teacher.
1658	Book with images	It was used in child education to teach the name of things by making a relation with the images.
1878	"Phonograph"	It was the beginning of the use of sounds.
1902/1903	Books of 'Speaking	They started using recordings that could be taken to the classroom to listen native speakers, it was used along with the "fonógrafo".
1930	Cartoons	Walt Disney produced cartoons for the purpose of basic English teaching.
1943	Movies	Walt Disney studios produces a film series; other didactic films were produced by CREDIF.
1943	Radio	Streaming of short English lessons.

Source: the author

This figure illustrates the basic structure that most of the groups delivered on Activity 5.1. The column that the girls entitled "use" is very similar to the concept of Affordance, because it shows what each tool allowed teachers and learners to do. However, there is no explicit connection to language teaching perspectives. Even when there was, because this activity was done during an asynchronous class and therefore, we did not interact verbally with students, we weren't able to tell if those connections were happening consciously.

This issue is illustrated in the figure below, which is a section from another timeline also from the afternoon group:

Figure 19 – Tech Timeline Sample 2



Source: the author

This was the group that came closest to what we were hoping to achieve with this Activity, but even here there is an issue. The choice of the group to include the sentence “The concept of language teaching at this time equals to the offer of linguistic descriptions. Learning a language meant learning the syntax of that language” indicates exactly the kind of association that we had in mind, and would also indicate conceptual development because, once again, it is impossible to learn a scientific concept without understanding the others in the system it is inserted (CLEDER, 2012).

However, the sentence is included between commas, in a quotation. Because this activity was done asynchronously, we had no way of knowing whether or not this was a conscious choice on their part or if it was just a mechanical movement of “copy-and-paste”. Later on, during the following class, we discussed these activities, elaborated on the instructions, and asked students to re-do it. It will be shown in the analysis of the September 17th class.

This is exactly the kind of issue that Sforni’s Principle 03, The Conscious Character of The Activity, aims to avoid. According to this principle, the concept being taught should be at the center of the learners’ consciousness, not the activity itself, which is what happened in this case.

When the author suggests “prediction of mental actions so that the central content of the activity is the focus of the students' conscience” as a teacher action (SFORNI, 2015, p. 389), she is indicating the importance of regardless of what kind of activity is being used to teach the concept, that this activity does not occupy the focus of the learners’ consciousness, but instead works as a mediator to conceptual development.

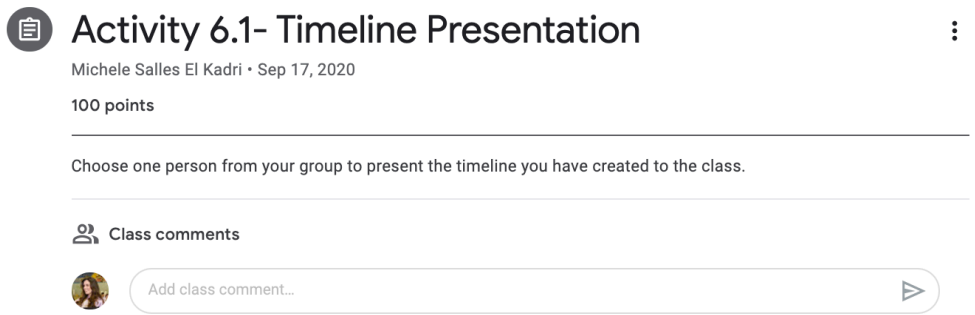
In this same principle, Sforni (2015, p. 389) also suggests the “prediction of mental actions so that the central content of the activity is the focus of the students' conscience”. These mental actions can be related to Vygotsky’s idea of Higher Mental Functions, such as focused attention, deliberate memory, logical thinking etc. Taking that into account and the importance of instruction within the FDE (SILVA, 2014), looking back now, I believe our instruction for this activity could have been better developed, and consequently, acted within the ZPD.

“*Your timeline should display the date (year) that tool was used, the tool itself and what it was used for*” seems to have been a clear instruction in the sense that the pre-service teachers were not lost in terms of what they were supposed to do (create a timeline about Technology in language teaching), but it also seems to have been a bit vague in terms of instruction towards conceptual development. The reason for that is that there is no indication, within the instruction, guiding the pre-service teachers to pay attention to the language and teaching perspectives that were implied in the use of each tool. It could be argued that we were hoping they would come to this conclusion themselves via the abstraction/generalization process that is part of conceptual development, but it seemed that they were not yet ready to this on their own – that is, the concept was not developed enough yet.

Therefore, on the following class, which took place on September 17th, the only designed activity was Activity 6.1, in which we asked the pre-service teachers to choose one person from each group to present the timeline they had produced for the previous asynchronous class.

September 17th

Figure 20 – September 17th



Source: the author

Again, going back to Sforni's (2015) principles, one of the suggested teacher actions for Principle 03 is "attention to the students' verbal explanations, which indicate whether they are establishing a relationship between the particular and the general." (SFORNI, 2015, p. 389). The purpose of asking the pre-service teachers to present their timelines orally was not a "time filler" as sometimes these kinds of activities are seen, but rather a tool for us to assess the level of consciousness with which they were operating with the concept, so that we could re-adjust the activities planned for the rest of the FDE accordingly.

The teaching episode we want to highlight within this phase of the FDE happened during this activity.

First of all, differently from Activity 5.1, this activity (and this class) started with a very clear goal, which the pre-service teacher were made aware of, so it can be considered a very clear instruction:

Chart 20 – Teaching Episode 02, part 01

"*Michele: […] So, guys, the aim of our class today is to get familiar with the concept of affordance. We know that this is not a totally new concept for you, because you have been working some other courses with the concept, trying to analyze some tools, but we are going to introduce and talk a little bit about affordance, because it has everything to do with what we are going to produce*. […] *So, we expect that by the end of this class you are able to see the relations between the affordances, the tools, and the theories and methods, or language conception and theories in language learning, ok? So this is what we expect you to be able to do by the end of the class."*

Teaching episode 02: Timeline Presentation

Michele's sentence is also very important to state that we did not dedicate more time to exploring concepts like language teaching perspectives because we knew it to be part of the curriculum of the undergraduate degree in previous years, so we assumed the pre-service teachers were familiar with those.

Now, we bring the four excerpts from this class in which one member of each group[43] is presenting the Timeline they created. The timelines they are presenting here can be found in the Annex (Annex B) section of this dissertation.

Chart 21 – Teaching Episode 02, part 02

Luis: Ok, so, as we read both texts, we found these tools. The first one that we found was the Codex, so it was similar to a book, made of animal skin, being first used before Christ. Then we find Gutemberg's Press. It was first used in 1442, used to print documents of the period. Moving on we have the Orbis Sensualium Pictus, that was the first children's book with images. This was used by teachers in order to educate them, in 1658. Then we have the Phonograph, that was used for teaching, teaching intonation, so it was a speech recorder. It was invented by Thomas Edison in 1858. Then the Gramophone that was used to listen and imitate the native way of talking, and we weren't able to find a date, concerning to its first usage. But according to the book and where it was established in the book, we fit it here. Then we have the Telephone that was a huge invention from 1877, we got the data around, because there was many dates with the telephone, so we got the one that was more succeeded rate, and then, it was also used for telephone assisted language program, where students received assistance and feedback on their progress by telephone. We have then the first recorded didactical material, and it was first used in 1901. It was used for learning the English language. Then we got the Disney's Cartoons. In the 1930s, Walt Disney studios created the first cartoon in order to teach basic levels of English. So, (inint) [00:26:12] started with the usage of movies in order to teach the English language. Then we have Television broadcasts. We weren't able to find an image to put here, but it included the production and the transmission of educational content. It was used in the late 30s. Then we have the radio, it was used in 1943, so BBC using radio started to provide people English lessons, and then in the US, the voice of American users provided English classes through radio and printed materials. And then we have the magnetic tape recorder that provided students to record their readings and repetition exercises, so that students could evaluate their own improvement. And it was used in the 40s. Then we have the teleprompter, that was an enhance in telephone device to stimulate communicative activities in the classroom, used in the 40s as well. Then we have the overhead projector, that was a language teaching tool that is used for (inint) [00:27:28] visual aid, in 1960. And the last one, the computer. In the 80s, the computer was created, and in the 90s they started to be used for educational purposes. And that's what we were able to find on both texts.

Teaching episode 02: Timeline Presentation

[43] At this point, because of a previously mentioned misunderstanding, there was a fifth group, but they did not meet the criteria for this activity, so that excerpt is excluded from this analysis.

Chart 22 – Teaching Episode 02, part 03

"Yasmin: Just one second. So, my group is Barbara, Izabella, Laís and Maria. Ours is a little bit mixed up, because we mixed both texts together, so as we see here, 1578 we have the book, which made possible for the students to study without the help from a teacher, and that was way long ago, before there was teaching, and then in 1958 we have books with images now, so it's easier for children to learn from looking at the images. And then 1878 we have the phonograph. It was the beginning of the use of sounds, so that was even better for learning. Then 1902 and 1903, we have books of speaking, we translated as this, it was first (inint) [00:29:49], livros de conversação. So I was in between speaking or conversation books, so I just left as speaking. And, they started using recordings that could be taken to the classroom to listen to native speakers, and it was used along with the fonógrafo, the instrument. I don't have the image here, but I'm pretty sure everyone knows. We have 1930, the cartoons, which Walt Disney actually produced for the purpose of people learning basic English, and then we have movies, and this is my favorite part. In 1943, Walt Disney started producing movie series, then we have radio as well, which there was a lot of streaming of short English lessons for people to listen to on live, English lessons that were streaming on the radio. And then we have 1940s, which was the creation of magnetic tape recorder, which allowed students to record their reading and their repetition activities, which enabled them to evaluate their performance. So, I believe that they would record and then they would listen to their own recording and they would correct their pronunciation and so on. And then we have the late 1950s, the creation of labs, or studios, which was a place that was soundproofed, and you had specific wiring, so it was a very good place for the student to study, so he could do his recordings because there wasn't any background noise that would prevent them from learning. And then, I repeat again, we have the radio, and we kind of repeat, so I'm going to move on a little bit. So you have ESL Cafe, and from what I understood, it was a website, which students could learn foreign languages, and reading and oral activities, they could find dictionaries and (inint) [00:32:50] there. Then 1997 we have the (instrumental) [00:32:56] reading course, and it was a software that would allow interconnection between computers through the telephone. […] *I'm going to move on a little bit because it kind of repeats. So, in 2000, finally, there was a (inint) [00:34:49] web, which would assist post-graduate students who were interested in improving their reading abilities for academic purposes, so basically for their university assignments. And then we have 2002, surfing and learning. This was a course that was directed to adults who used the internet and needed to learn at least basic English so they could communicate with other (inint) [00:35:19] and asynchronous tools. And last but not least, we have 2004 to 2006, teachers' links, which was a set of work courses from 1988 and was (inint) [00:35:38]. From what I understood it was courses (inint) [00:35:49]. And that is it."*

Teaching episode 02: Timeline Presentation

What these excerpts from the teaching episode show us is that, as well developed and structured as these presentations and the timelines were, it is clear that, in fact, the focus of the pre-service teachers' consciousness was overtaken by

the activity itself instead of the concept (SFORNI, 2015), so professor Michele and professor Denise interfered:

Chart 23 – Teaching Episode 02, part 04

"Michele: Thank you, Yasmin. Very nice. Guys, could you notice the difference between Paiva's text and (inint) [00:36:05], I think, text? The way they present? Do you see any difference? Because Luis' group focused on Paiva's text, right, Luis? And then the kinds of tools that you presented, they see technology as a tool. Remember when we discussed? Technology as a tool, technology as a process, as a method, as a procedure, something like that? How do you think Paiva's text presented technology? Can you see that? The difference. Because Yasmin's groups, they mixed both texts, and then there is a difference between the two timelines. What is the difference?

Yasmin: Mine was uglier than Luis'.

Michele: Not in this sense.

Denise: We're talking about the content.

Michele: The technology, I mean. Have you seen, guys? Any difference. What Paiva presented as a tool. For example, in Luis' group, they presented computers, phonograph, gramophone and this kind of stuff, right? So, technology seen as a tool, just as a tool. Paiva, in that text, she understood technology as a tool. And when you see, for example, in Yasmin's timeline, when she added (inint) [00:37:45]'s text, you can notice that there is a different conception of technology tools, right? Technology seen as a method, as a procedure, because she brings apps, links, projects, courses. Do you see the difference? Were you able to see when they represented this kind of difference?

Nicole: Yes, I saw that in Paiva's text, she mentions tutors as a tool. But it's not something like physical, (key) [00:38:33] for me to use, as a technology.

Michele: Thank you, Nicole."

Teaching episode 02: Timeline Presentation

Yasmin's comment is obviously a joke in this excerpt, but metaphorically, it is a very good representation of what had been happening thus far: their focus was on the activity, not the content. Following this moment, the other two groups present their timelines:

Chart 24 – Teaching Episode 02, part 05

“Tatiana: Ok, I can. I did this together with Taís, Larissa, (inint) [00:39:07], Nat, Nicole e Talita. I think that we also put the two texts together. So, I think that we have a lot of things that are very similar, so it started in 2000 years before Christ with volumen, that is a roll containing sheets of papyrus, then the codex, then there is papyrus, individual pages. In the 14th century something important happened in education in general, and that (inint) [00:39:38] the state and the church (inint) [00:39:41] which will trigger many censorship around the world, even centuries later. Gutenberg's invention was very important as well, the first press machine, and then we go to the middle ages. We got here a bit mixed. (inint) [00:40:04] to process grammar books, and in 1578 was the first didactic book used by students. We gave the student possibility to study without the teacher, and it was published by Emperor Belarmine. 1658, first book with images, it was meant for children. It was called Orbis Sensualium Pictus, made by Comenus, who believed with other senses helped memorization. So, it gives us focus on the process of learning. Here we go again with phonograph that they mentioned already. 1901 it was created the first recorded didactic material. 1926, here comes the television. At first it was a luxury object, but then it's something that everybody has. So, that was the television. In 1930 Walt Disney created cartoons, and will use for basic English teaching, triggering the series of real movie actors in projects such as The March of Times, and others. 1934, there was a radio, which allowed distant learning. There was a radio broadcast, students wrote down all or part of the material presented orally, and then portions of the material were shown with the overhead projector, that is also another very important innovation. 1940, the audio-active voice reflector. It's a device, sort of acoustic shell. So, it fits over the user's lower face and reflects a portion of his voice up and rearward to the earpiece. So, it allowed to record a lesson, so you could (inint) [00:42:19], evaluate and hear your own voice. Then we are here in 1943. Again, there are small transmissions through radio. But it wasn't until the 1960s that it was transmitted English lessons to 30 languages all over the globe, so it was very important for language learning. In 1991 there was the Cold War, the first computers emerged during the Cold War to transfer data quickly, and in a secure way by using the ARPANET electronic network. At this stage, the computer was only to (inint) [00:43:03] a data and information, so it wasn't available to everybody. Then we got 1957, there is a release of Verbal Behavior, by Skinner computer-based teaching, it was considered a breakthrough. So, then phonograph disks, wire recorders, magnetic tape recorders in soundproof laboratories (inint) [00:43:33]. 1960s language laboratory, use of the phonograph's tape recorders, and other electronic devices, and this year, the program logic for automatic teaching operation's project starts. This project aims at teaching computer mediated language, so this was very important as well. 1961, we don't really know until when, but (inint) [00:44:01] used their (inint) [00:44:02] on the streets, so they could use transcripts. It is a very inexpensive, it's a very cheap pedagogical tool that can be used for many different activities. Overhead projector, this was very important, and it's used until now. It enables the teacher to project the material in class. Allow information written on overlays to be easily and quickly hidden, etc. We know all of it because we use it until today. Then, television broadcasts. The teacher receives the lesson, implements, and (inint) [00:44:41] intercorrelated for a lot of activities, and (inint) [00:44:47] key interest in (inint) [00:44:49] and to use in the classroom situation. Then we've got 1972, Brown Diets Frits Audio-active voic recorder. We have these.

(inint) [00:45:02] the problem here, I think we copied some of those. 1976, spectrograph. This was used for accurate imitation of native intonation in the controlled environment of the language laboratory. I think that in the first year, Denise told us that they used this, (inint) [00:45:20] learning some language. 1980, there were some obstacles, as the high cost of computers, lack of technological support, and then the Daedalus Interchange, the writing environment provides a discipline-specific web space for creating, participating and managing writing courses, so here you can see that part of the activities were made for specific skills, language learning. MLJ computer courier covered many areas of information about computer technology to predictions on future developments in the field. Then in 1990, Bland, Nobiff, Armington and Gay, here you have new developed computer technology, where the second language learners rely on one two one lexical match for the translation of words and expressions. 1991 in Brazil, access to the world wide web takes place, with the creations of Rede Nacional de Pesquisa. And this network connected many universities and professors to talk about their peers abroad, and to talk (inint) [00:46:54]. 1995, this year, one of the first pages with free material for students called the ESL Cafe was created. I think it's (inint) [00:47:06] we use. 1996, Macintosh multimedia program. (inint) [00:47:13] a language. Annotations for up to 82 words on the left hand side. 97, Programmed Logic for Automatic Teaching Organization. 97, in Brazil, professora Heloisa Collins, who started the offer of English language courses by the university PUC São Paulo, the course of eight weeks, and it was aimed at adults who (inint) [00:47:51] communication (inint) [00:47:51] English. 98 it was launched instrumental reading which is four online extension courses, to train English teachers in public schools in São Paulo. And then we got a lot of things that happened in the 21st centuries. Like using blogs, Orkut, (inint) [00:48:17].”

Teaching episode 02: Timeline Presentation

Chart 25 – Teaching Episode 02, part 06

“Philipp: (inint) [00:49:44]. So, we have the book, then (inint) [00:49:51], the invention of phonography, and then I remember one video that I watched on Youtube that is, the first (inint) [00:50:03] we have used today, and it kind of illustrates how phonography operates, and how was the sound of the voice recorded by phonography at that time. We have the (inint) [00:50:22] version of phonography, that was used by Clark to teach pronunciation, and then we have to remember that at this time, phonography, you had to have the recording, because later on, the radio allowed to have a distant learning, (inint) [00:50:41], you didn't have anymore to have the recording at your place. You had, for example, the (inint) [00:50:49]. And then we have the telephone. Telephone, the improvement of radio frequency, etc. And we arrive at television, films and videos, and I liked very much this quote, the television broadcasts, a natural extension of the use of radio broadcasts, because I remember this song, when I read this quote, Video killed the radio star. I thought it would be a very goofy moment in our timeline, and kind of illustrates the quote. So, we have the invention of television. An academics that thought of the use of television to educational purposes. And, my favorite part, conventional and unconventional tools, because when we think about this, (inint) [00:51:54] remember that that was a lot of miracle (inint) [00:51:58], invention and most of them were very (persuasive) [00:52:03] to say. So, for example, I liked very much this image, learn while you sleep, that is the dormiphonics technique from 1950s. I like the design because it's very connected to what we think about the 40s, 50s advertisements. So, we have this one, the blackboards and overhead projectors, the audio-active voice reflector, and then the spectrograph from 1976, that I thought would be interesting to put (inint) [00:52:42] works, how we see both, how it is and how it works. The audiolingual era, language laboratories. And in the computer era, because both texts end at this point, we thought about organizing our timeline in two categories, (inint) [00:53:09] from Salaberry's was organized, and we thought it would be more, it would (inint) [00:53:19] coherence of a timeline because it is implied that, for example, (inint) [00:53:28] television was an improvement, so one came after the other, and inside each category we have (inint) [00:53:37]. And that's it.

Teaching episode 02: Timeline Presentation

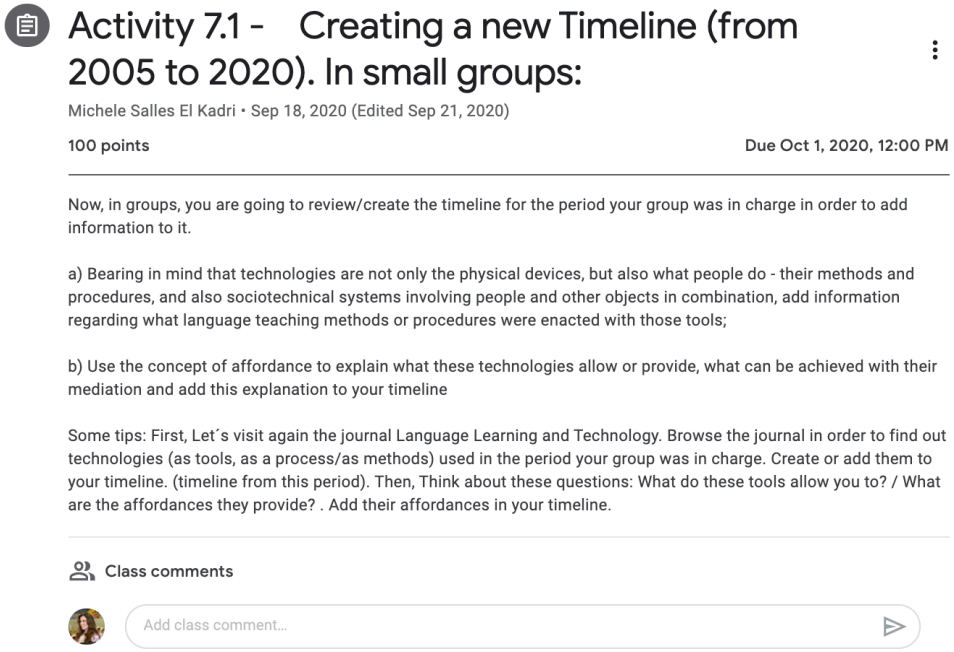
These excerpts, which show the Timeline presentations from the other two groups, confirm that, in fact, the focus of the pre-service teachers’ consciousness was the activity itself, the structure and creation of the Timeline, and not in analyzing Technology within language teaching historically as was the intention of this activity. Sforni (2015) states that when this happens, conceptual development is usually affected in a negative way. For there to be learning and development, it is necessary that the focus of the learners’ consciousness be the concept, and the activities work as a support only to understand that concept (SFORNI, 2015).

Therefore, on the following class, which took place on September 24th, we revisited this activity.

September 24th

There are three activities registered on Google Classroom for the September 24th asynchronous class.

Figure 21 – September 24th Activity 7.1[44]

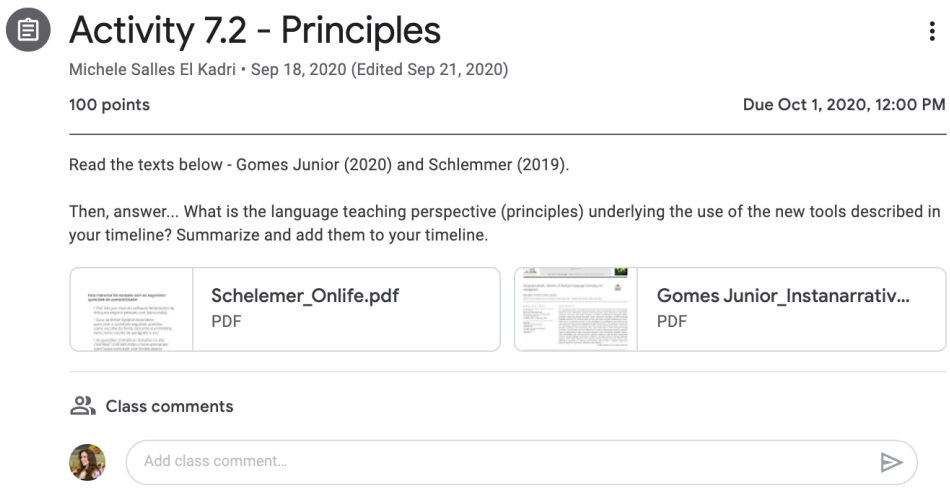


Source: the author

Regardless, with the goal of bringing the focus of the pre-service teachers' consciousness back to the concept of Technology within language teaching, on Activity 7.2, we brought more scientific texts by Gomes Junior (2020) and Schelemer (2019), and asked the pre-service teachers to, after reading them, reflect upon the following question: "What is the language teaching perspective (principles) underlying the use of the new tools described in your timeline? Summarize and add them to your timeline."

Figure 22 – September 24th Activity 7.2

[44] For clarification purposes, it is important to mention that the order of the activities for this class is inverted on Google Classroom. Activity 7.1 was supposed to be Activity 7.2 and vice-versa. This is just to say that we wanted the pre-service teachers to do Activity 7.2 before 7.1. This small mistake happened because, originally, Activity 7.1 was intended to be part of the September 17th class, but there was no available time for that.

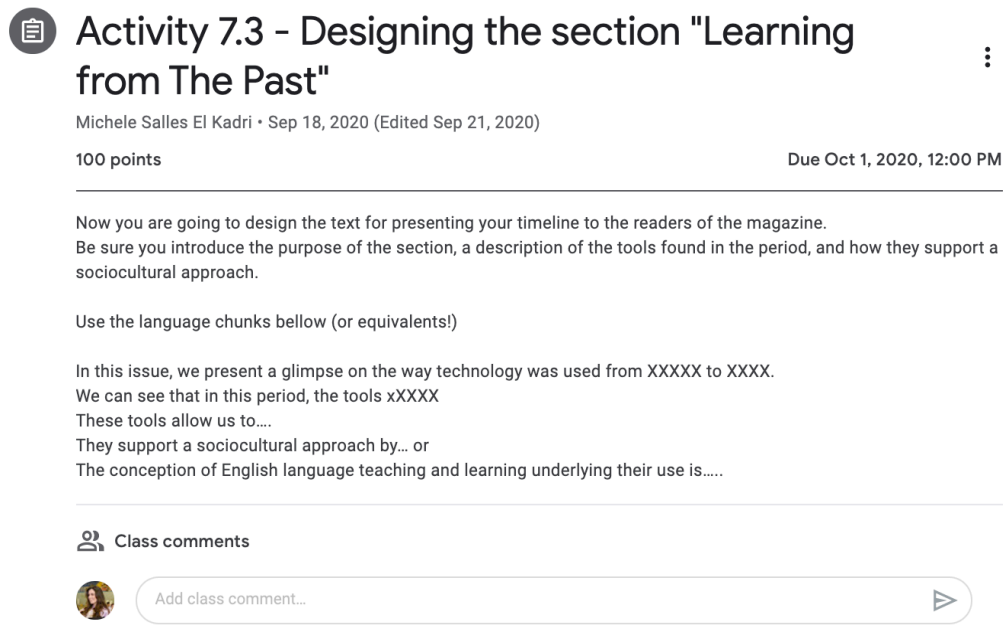


Source: the author

With this activity we once again wanted to make sure that the focus of their consciousness was the concept, not the activity, as Sforni (2015) suggests on Principle 03: The Conscious Character of the Activity and, since they were still working on their Timelines, it allowed them to deepen their understanding of the history of technology in language teaching. It also allowed them to identify the core principles which were underlying it in its different historical moments, which is a movement suggested on Principle 05: Action Mediated through Concept. These two movements, having the concept as the focus of the learners' consciousness and identifying its core principles, are, according to Sforni (2015), essential to conceptual development and, therefore, to learning and development, so it was vital to set them in motion.

Finally, on Activity 7.3, illustrated on the figure that follows, we asked each group to start working on the introductory text they'd used for the section "Learning from the Past" on their issue of the magazine – that is the section in which the Timeline is featured.

Figure 23 – September 24th Activity 7.3



Source: the author

This activity, on top of further advancing the development of the Magazine itself, also allowed the pre-service teachers to create a (guided) synthesis of all of these movements that had been our goal to set into motion as we led them to work and re-work on the Timeline. Once again, language is the best indication of conceptual mediation and development (SFORNI, 2015) so this Activity was also an effective way for us to assess that.

The productions the groups handed in on Activity 7.3 indicate that, in fact, by following Sforni's principles (2015), we were able to bring the focus of their consciousness back to the concept (Technology, in this case), and their writing seems to indicate that at this point, they were, in fact, mentally operating with this concept as a scientific concept.

Below is an example. The image that follows demonstrates the production handed in by Group 01.

Figure 24 – Learning from the Past – Group 01

In our timeline, we present some technological tools used in language learning classes from 2006 to 2009. Throughout this period, the use of peer online interaction tools was a trend in language learning classes. These tools allowed the learners to have contact with the language; to interact with not only with their classmates but with people around the world; to have constructive feedback; and to practice their language skills socially, with assistance from others. Considering the social interaction these tools foster, they support a sociocultural approach by using instruments to mediate the interactions. Also, by connecting learners with different linguistic proficiencies, the students learn by interacting with their peers. The conception of learning underlying the use of these tools is the connectivism approach, that states learning as the process of connecting and navigating the networks, in other words, the human interaction with other humans and technological artifacts.

Source: Activity 7.3

As the paragraph shows, the group was able to easily talk about both the tools being used and the underlying teaching and learning conceptions.

Another example is found on the production handed in by Group 4.

Figure 25 – Learning from the Past – Group 04

In the year of 2014, the examples we bring are some tools such as Twitter, online games, and Wiki. Although these technologies were not launched in the year of 2014, they were used as tools for learning language processes. The conception of English language teaching and learning underlying their use is working with writing competencies, vocabulary input, L2 learning, grammatical structures, collaborative writing, among others. Twitter is a platform used to interact through small sentences. This technology allowed teachers to work with small sentence structure, grammar skills, as well as it worked in a real-world context. In online games, it was possible to observe foreign language input, and results showed that advanced gamers also had a more advanced vocabulary. In Wiki, the possibility of editing simultaneously supports a sociocultural approach by providing interaction between real people from all around the world, interacting on real-life issues. Besides, it allows the professor to act in subjects who personally interest the students.

Source: Activity 7.3

This group wrote, beyond the introductory paragraph, a paragraph for each time period presented in their new timeline. This was unnecessary for this activity, but it was very useful in terms of assessment.

As Figure 25 demonstrates, the group very explicitly talks about language and teaching perspective, beyond talking about the tool being used.

Once again, this is evidence that points towards conceptual development, since the concept of Technology was again at the center of the pre-

service teachers' consciousness, and the collective synthesis elaborated by the groups also indicate that.

In terms of Digital Literacy, the processes which this sequence of classes working with the tech Timeline (September 10th, 17th and 24th) set into motion are explained in the chart below:

Chart 26 – Tech Timeline & Digital Literacy

Class	Assignment	Digital Literacy Process (MARTIN & GRUDZIECKI, 2006)	Descriptor (MARTIN & GRUDZIECKI, 2006)
10/09	Create Tech Timeline	Identification Accession Creation	To identify the digital resources required to solve a problem or achieve successful completion of a task; To locate and obtain the required digital resources To create new knowledge objects, units of information, media products or other digital outputs which will contribute to task achievement or problem solution
17/09	Present Tech Timeline	Analysis	To examine digital resources using concepts and models which will enable solution of the problem or successful achievement of the task
24/09	Revisit Tech Timeline & Create another one	Synthesis Creation	To recombine digital resources in new ways which will enable solution of the problem or successful achievement of the task To create new knowledge

			objects, units of information, media products or other digital outputs which will contribute to task achievement or problem solution

Source: the author

As the chart shows, the creation of the Tech Timeline set into motion the same processes that were identified in the Digital Story activity: it required the pre-service teachers to identify what tools they would need to complete the task at hand. Once that process was done, they needed to access the tool and use to create the Timeline collectively.

On September 17th, we guided them to analyze theirs and their colleague's timeline from the perspective of language teaching, so that they could realize what was missing and how to add it.

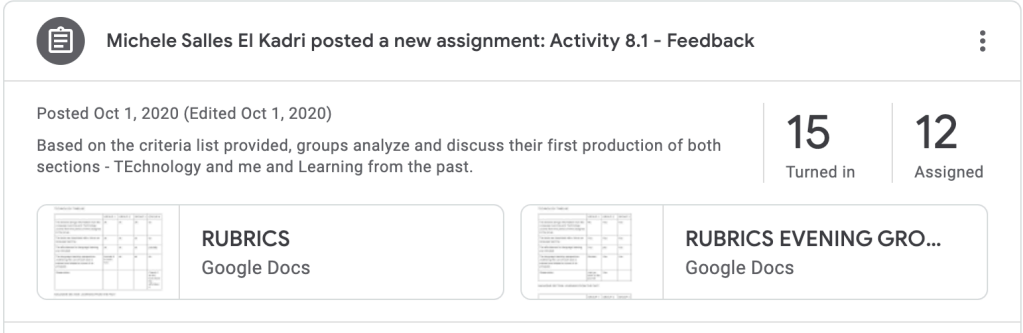
Finally, on September 24th, the pre-service teachers went through the synthesis process as they adjusted their Timelines and also as they *created* a new one, since now, with the concept as the focus of their consciousness (SFORNI, 2015) they were able to re-combine the digital resources used in order to successfully complete the task at hand.

We consider the following class of October 1st to be the last class of the "first half" of the FDE. This class is analyzed next.

October 1st

There are two activities registered on Google Classroom for the October 1st synchronous class, and they are complementary to one another.

Figure 26 – October 1st , Activity 8.1



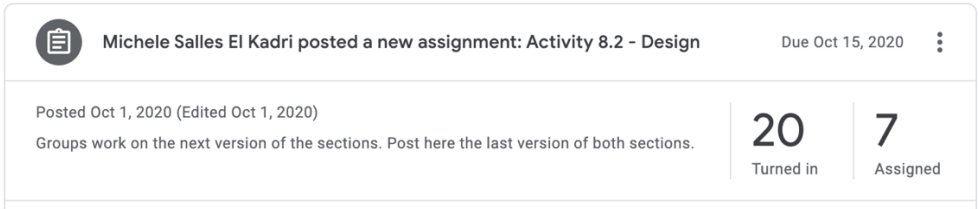
Source: the author

For activity 8.1, we proposed what we're calling here a "guided self-evaluation". We provided the pre-service teachers with three charts containing rubrics for assessment of the three "main" activities they had developed so far: the technology timeline and the two sections of their magazine (Technology & Me and Learning from the Past). In order to perform the activity, we once again separated the class into different Google Meet rooms (one for each group), but this time, there was a confusion regarding the links, and Professor Denise and myself ended up on the same Google Meet room with two groups.

Besides giving the pre-service teachers an active rather than passive role, which is an important part of the process of conceptual development according to Sforni (2015) this activity was also tending to Principle 05: Action Mediated through Concept. This principle suggests the "elaboration of problem-solving situations, which require students to mediate the concept" (SFORNI, 2015, p. 392). We created the rubrics, but instead of using them ourselves, we provided them to the pre-service teachers and asked them to assess their own work. The only way they could do that successfully would be to mediate the concept, that is, to mentally operate with the concept to the extent that they can identify it (or the lack of it) in their own work. This movement is essential for pre-service teachers, since assessment and evaluation are recurring activities in a teacher's daily routine, and it is what they are being educated for.

For activity 8.2 we asked the pre-service teachers to revisit those three main activities (tech timeline and the first two sections of the magazine issue), work on them some more if they felt it was necessary following the reflections done and conclusions reached on activity 8.1, and then post new versions of each of them on Google Classroom.

Figure 27 – October 1st , Activity 8.2



Source: the author

Once again, the pre-service teachers are at the center of the process, actively participating in it, performing an activity which requires them to be mentally operating with the concept (Technology) in order to be able to successfully complete it (SFORNI, 2015).

Below, I bring an example of these movements through a teaching episode retrieved from the recording's transcript of the group (or groups, in this case) that I accompanied, along with Professor Denise, during this activity.

The image that follows illustrates the chart (with the rubrics) provided for this activity – specifically, the one referring to the Tech Timeline, because that is also what the teaching episode is about.

Figure 28 – Rubrics

RUBRICS

TECHNOLOGY TIMELINE

	GROUP 1	GROUP 2	GROUP 3	GROUP 4
The timeline brings information from the Language Learning and Technology Journal from the period of time assigned to the group	ok	ok	Ok	ok
The tools are described with a focus on language learning	ok	ok	ok	ok
The affordances for language learning are indicated	ok	ok	ok	partially
The language teaching perspective underlying the use of each tool is inferred and related to some of its principles	Include it in each tool.	ok	ok	ok
Observation				Check if all the tools have the affordanc e.

Source: the author

As the image shows, each group went through each criteria for the technology timeline, reflecting on whether or not they had achieved it and completing the chart accordingly.

The teaching episode shown in the excerpt brought below shows this process for Group 01 – specifically, it shows Professor Denise and Gabrieli, one of the group members, reflecting on each item of the rubrics together.

Chart 27 – Teaching Episode 03

Denise: And do you think that you have described the tools with a focus on language learning? For instance, you've mentioned YouTube, did you include anything related to language learning in it?
Gabrieli: Yes, I think we did because most of the tools we had to inform four and three of them were related to peer accessing, so they use this tool to access language learning through the internet. So I think yes, we included.
Denise: And how about the affordances? Did you mention the affordances for language learning? Can you name a few if you have done that?
Gabrieli: Yeah. I will talk about the first one that we found, it was tag clouds, it was used in 2006 and it was used in language learning, especially in reading and writing classes to summarize, to learn vocabulary, to respond, and so on. And this tool offers options for collaborative work and tagging text in collocation (inint) [00:01:48]. In the others, we added the information as well.
Denise: And maybe you could tell me a little bit about the language learning or language teaching perspective underline the use of each tool. Were you able to infer that?
Gabrieli: Yes. We didn't put in every tool that we found because all the tools that we've put there were all in the connectivism perspective, so we added a new column and then we wrote what is connectivism and how this principle was underling these tools because, as I've mentioned before, the three of them were related to collaborative work with peer accessing, so we did relate it to connectivism and the tag cloud also brings this collaborative or group work so all of them we thought that were related to connectivism.
Denisei: You could have explained how the tools can relate to one of those educational models. Maybe focusing on the kind of communication, if it's a one-way communication or if it's an ecological or echo systhemichal, as they say, right? The kind of feedback that it provides learners. You don't have to use everything, but if you haven't maybe you could make an effort to include some of those ideas too, in terms of communication, in terms of interaction.
Gabrieli Rombaldi: Yes, we will. Now we understood.

Teaching episode 03: Tech Timeline Rubrics

Gabrieli is speaking on behalf of her group here (most of the time she uses the pronoun “we” when describing the changes made to the timeline), and it is

very interesting to notice how her speech here is extremely different from Luis Henrique's speech, for example, when he presented their groups' timeline back in the September 17th class. Gabrieli is able to easily incorporate scientific language in her speech at this point in the FDE. Sforni (2015) emphasizes that this growing familiarity with scientific language is an important part of conceptual development.

An interesting detail from this excerpt is when Gabrieli says, after Professor Denise suggests a few other changes, *"now we understood"*. She seems to be rereferring to the assignment of the tech timeline, which once again stresses the importance of identifying and working within the ZPD (VYGOTSKI, 1978). When Gabrieli says that *"now"* they've understood what they were supposed to do, she is implying that after our interference, that is, with the help of a more experienced peer, they were able to complete the task at hand and, judging by the way she talks here, to expand their scientific/conceptual knowledge on the topic through the activity.

As previously mentioned, this class was the end of the first half of the FDE. We did not discuss these activities with the pre-service teachers anymore after this, meaning that, once the class was done, the assignment they had left to do was to actually create and put together the first two sections of the magazine: Technology & Me, which would incorporate the Digital Stories, and Learning from the Past, which would incorporate the timeline.

In terms of Digital Literacy, this stage of the production of the magazine activates two processes: synthesis and creation (MARTIN & GRUDZIECKI, 2006). Synthesis means "to recombine digital resources in new ways which will enable solution of the problem or successful achievement of the task" and creation means "to create new knowledge objects, units of information, media products or other digital outputs which will contribute to task achievement or problem solution" (MARTIN & GRUDZIECKI, 2006, p. 257). The pre-service teachers had to *recombine* the digital resources used to create the Digital Story, the Timeline and the Magazine, and, at the same time, they were *creating* something new (the magazine sections).

On the following section, we analyze the second half of our Formative Didactic Experiment, starting, again, with the first two principles.

4.1.1.1 Teaching that promotes development & the active character of learning (again)

For the first two classes of the second half of our Formative Didactic Experiment, the guiding principles were once again Principle 01: Teaching that Promotes Development and Principle 02: The Active Character of Learning (SFORNI, 2015). The chart below shows an overview of these principles and classes.

Chart 28 – October 8th to October 10th

Date	**Class/Assignment Description**	**FDE Principle 01: Teaching that promotes Development – Teacher Actions**	**FDE Principle 02: The Active Character of Learning**
08/10	Asynchronous Class Assignment: develop a Concept Map on the topic "Digital Literacy".	a) assessment of the actual level of development and prediction of the potential level of development; b) use of activities that mobilize the Higher Mental Functions; c) creation of situations in which students verbally express what and how they are thinking (how they are mentally acting with the concepts).	"a) incorporation of problem-solving situations that allow the student to be inserted in the investigative horizon that first originated the concept; b) Planning moments for students to dialogue with each other and prepare collective summaries, even if they are not definite; c) guidance of the process of
22/10	Asynchronous Class Assignment: develop a set of guidelines for the creation of pedagogical activities for the development of digital literacy and language skills.		

			elaboration of conceptual summaries by students." (Sforni, 2015, p. 387)

Source: the author

As we can see on the previous chart, the activities designed in the course were meant to be the didactic transposition of these two principles. On October 10th, an asynchronous class, the pre-service teachers were assigned with the task of developing a Concept Map on Digital Literacy. There were no classes on October 15th. On October 22nd, the assignment was the elaboration of a set of guidelines for the creation of pedagogical activities for the development of digital literacy and language skills.

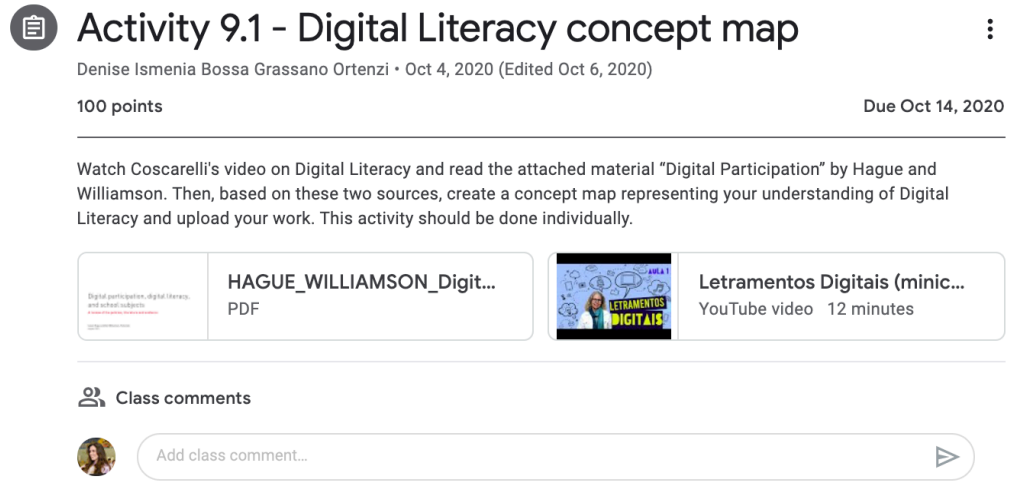
Now, I present and analyze, chronologically, each one of these activities.

October 8th

For the asynchronous class that took place on October 8th , the assignment was a Concept Map[45] on Digital Literacy.

Figure 29 – October 8tht

[45] The reason we refer to this activity as a Concept Map and not a Mind Map like in the first asynchronous class of the course is because it is our understanding that a Mind Map demands the learners (in this case, the pre-service teachers) to draw on their background knowledge. On the other hand, a Concept Map would require gathering information on a given topic from some kind of resource other then background knowledge, like the texts we provided on this activity.



Source: the author

We indicated a text by Hague and Williamson and a YouTube video by Coscarelli, both of which approached the concept of digital literacies. We asked the pre-service teachers to watch the video, read the paper, and then, based on both sources, create (individually) a concept map that reflected their understanding of Digital Literacy.

This activity was elaborated based on Principle 01: Teaching that Promotes Development. Within Principle 01, Sforni (2015) argues that the higher mental functions tend to be developed as they are activated, and they should be activated through the activities and assignments proposed. The types of activities that the author points as most effective in activating the higher mental functions are those that can be described with verbs such as “explain, analyze, justify, demonstrate, argue” (SFORNI, 2015, p. 384).

A concept map on Digital Literacy would require the pre-service teachers to *analyze* the resources we indicated (the paper and the video) and then *demonstrate* their understanding of both resources within the map. In other words, this activity would work with their higher mental functions and, therefore, potentially, foster development.

Furthermore, a Concept Map relies heavily on language to make sense. It is through language that the connections within the branches of a Concept Map are clear (or not). This attention and importance given to language and verbal expression is also part of Principle 01: Teaching that Promotes Development. Sforni

(2015) argues that it is through language, whether written or spoken, that one can identify how learners are mentally operating with the concepts that are being taught.

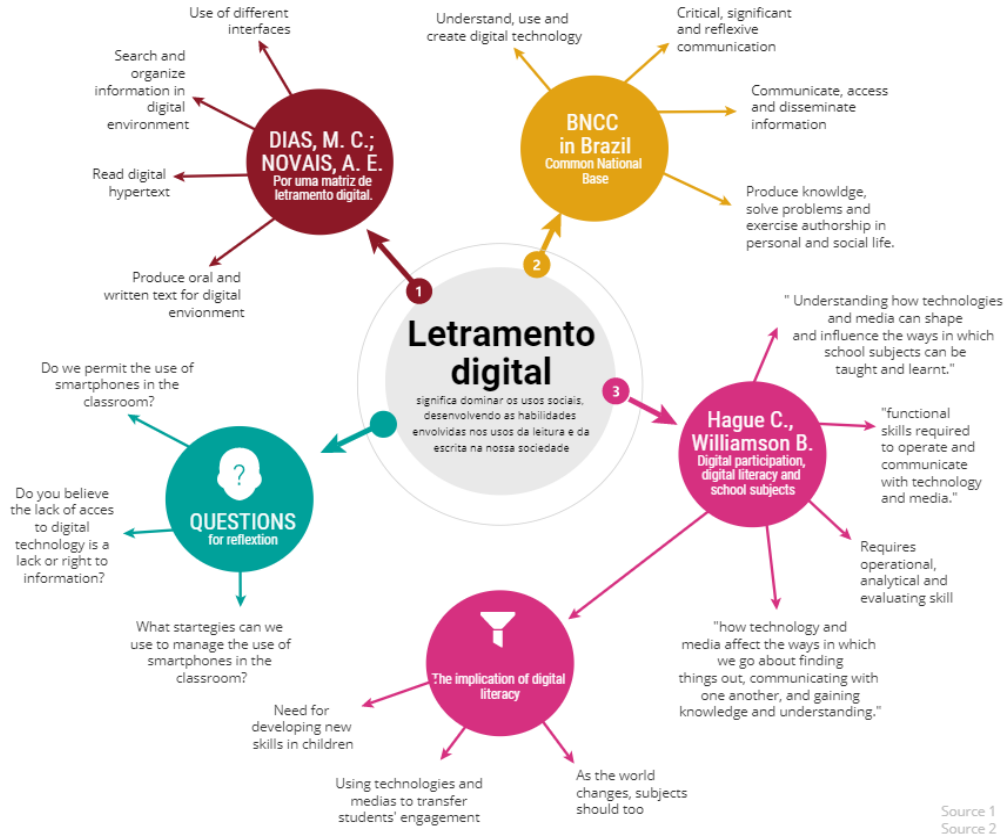
Regarding the processes of Digital Literacy (MARTIN & GRUDZIECKI, 2006), within this activity, it is possible to identify the same three processes of Digital Literacy (MARTIN & GRUDZIECKI, 2006) that were identified within the creation of the Digital Stories, which were: identification, accession, and creation.

As previously mentioned, identification means “to identify the digital resources required to solve a problem or achieve successful completion of a task” and accession means “to locate and obtain the required digital resources” (MARTIN & GRUDZIECKI, 2006, p. 257). The creation process involves the creation of “new knowledge objects, units of information, media products or other digital outputs which will contribute to task achievement or problem solution” (MARTIN & GRUDZIECKI, 2006, p. 257).

In order to develop their Concept Maps, the pre-service teachers had to *identify* a tool, get *access* to it and then *create* their Concept Maps based on their understanding of the provided texts.

The Concept Maps that were handed in demonstrated different levels of Digital Literacy understanding. Some of the Concept Maps were very thorough and presented most, if not all, concepts explored both in the video and in the paper, like Tati’s Concept Map.

Figure 30 – Tati’s Concept Map



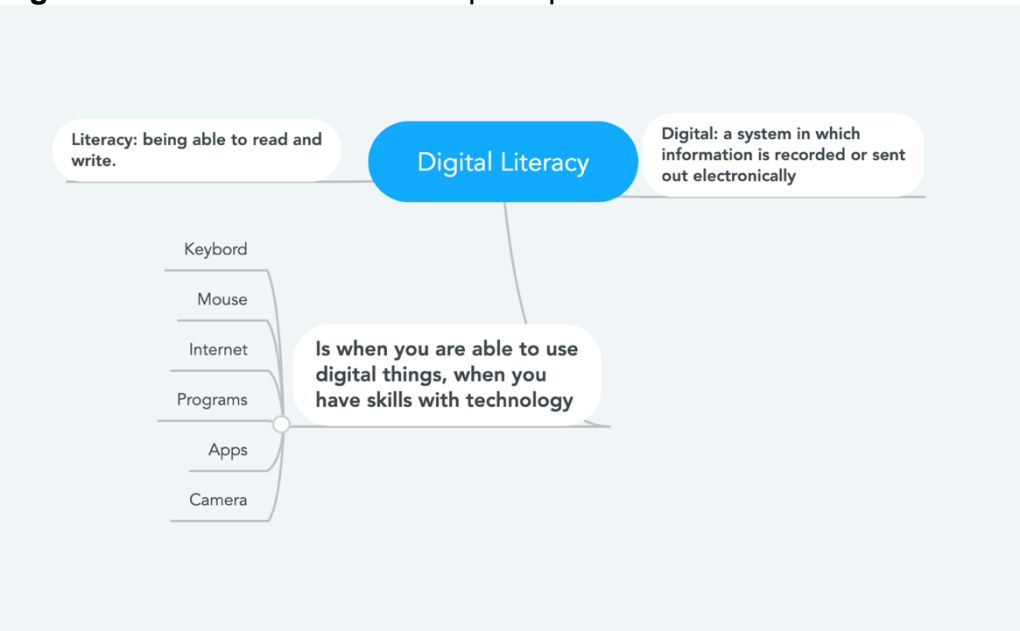
Source: the author

Some of Tati's notes are quotations, meaning she "copied and pasted" them from the original text, like when she's referring to the paper we asked them to read. There are other notes which are her own – still based on the resources we indicated, but explaining what she read and wrote in her own words. Regardless, her Concept Map seems to indicate a scientific understanding of Digital Literacy. Even when she quotes a scholar, she had to understand the concept of Digital Literacy so as to be able to choose which quotations would fit better in her Concept Map and demonstrate her understanding of the concept.

Going back to Sforni's (2015) classification of activities within Principle 01: Teaching that Promotes Development, the fact that Tati *demonstrates* her understanding of Digital Literacy within her Concept Map seems to be an indication that, for this pre-service teacher, the activity was effective in activating higher mental functions, and it seems to have help with the development of the concept of Digital Literacy.

The same cannot be said about some of the other Concept Maps that were handed in, like Maria Luiza's Concept Map.

Figure 31 – Maria Luiza's Concept Map



Source: the author

Once again, going back to Principle 01: Teaching that Promotes Development, one of the most important ways of identifying how the learner is mentally operating with the concept is the "creation of situations in which students verbally express what and how they are thinking" (SFORNI, 2015, p. 385), which is what we aiming to do through this Concept Map.

Based on that, we are able to say that, for Maria Luiza specifically, the activity was not successful in activating higher mental functions, as her Concept Map is quite limited. Not only she does not mention all aspects of Digital Literacy that were approached in the resources given, but her understanding of the concept itself, as it is represented in the Concept Map, also seems limited.

One of the disadvantages of asynchronous classes was that, when something like this happened, we could not be sure what kind of limitation exactly we were dealing with. In other words, we could not know for sure if Maria Luiza's Concept Map was limited because her understanding of the Concept was limited or if there was another issue during the performance of the activity that led to this final result.

All of the other Concept Maps that were handed in where similar to one of the two examples above: either the Concept Map demonstrated that the pre-service teacher in question was mentally operating with the concept of Digital Literacy or that their understanding of it was limited.

Because we were following Principle 01: Teaching that Promotes Development, when deciding what the next assignment would be, we had to have the next level of development of the pre-service teachers in mind. However, the Concept Map activity had demonstrated that there were different levels of actual development within the same group, so how could we move forward? Sforni (2015) anticipated this difficulty, and suggests identifying and focusing on the Zone of Proximal Development of the group, instead of focusing on each learner individually.

Therefore, we took another look at the Concept Maps and tried to establish what was common to all of them, meaning which aspects of Digital Literacy seemed to already be well understood and which ones required more work. After this analysis, we realized that our group was very familiar with the technological aspects of Digital Literacy, meaning that all Concept Maps linked Digital Literacy to knowledge of digital tools, platforms and gadgets, and not just technical knowledge, but critical awareness as well. The aspect of Digital Literacy that seemed a bit hazy was the translation of these concepts to the classroom, in other words, how could these skills and awareness be developed within the language classroom?

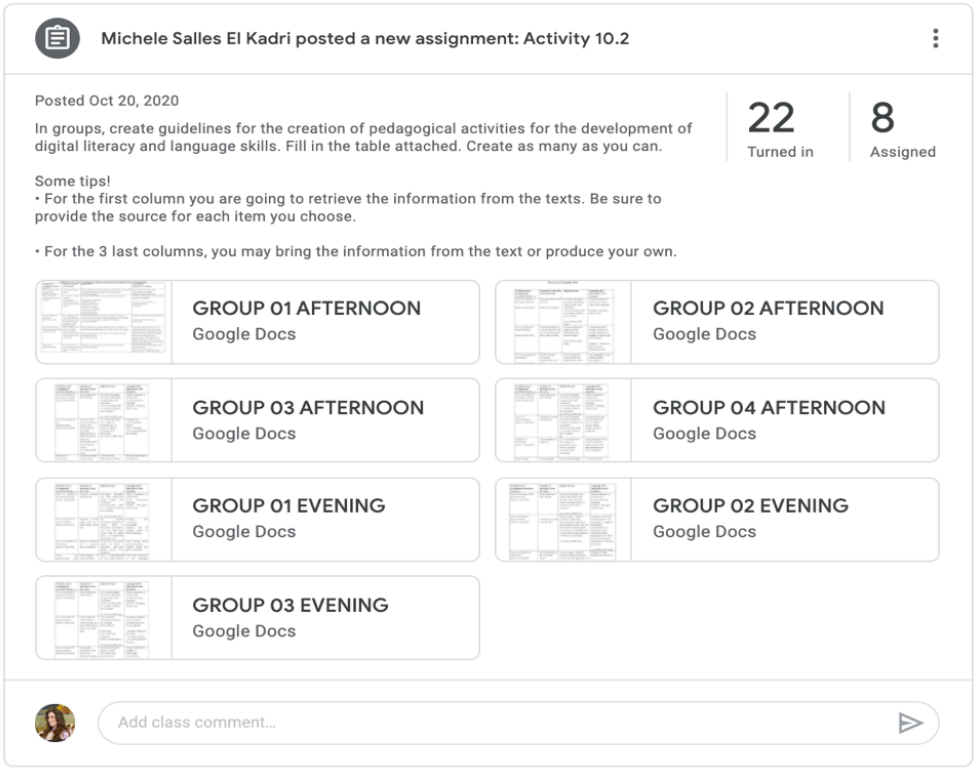
Once again, with the next level of development in mind (Principle 01: Teaching that Promotes Development), this was the "gap" within the Zone of Proximal Development of the group that we tried to work with in the following assignment of the course.

October 22nd[46]

The October 22nd class was also asynchronous. For this class, the assignment was to crate guidelines for the creation of pedagogical activities for the development of digital literacy and language skills.

[46] There was a one-week break between this and the previous class (October 8th), that is, there were no classes on the 15th. This short break was a suggestion from the University's headquarters, since, because of the delay on the academic calendar that happened during the time undergraduate programs had not yet shifted into the emergency remote learning mode, nobody had gotten the usual winter break. It was not a mandatory pause, though, so we discussed it with the pre-service teachers, and they voted yes, which we were very happy about because we were also in need of break. We then decided to start off with another asynchronous class for a smoother return and because the activities we had in mind made more sense for an asynchronous class.

Figure 32 – October 22nd Activity 10.2



Source: the author

As the figure above indicates, we posted a chart that would guide the development of those guidelines, and it was the same for every group to fill out. That chart is reproduced below.

Chart 29 – Developing guidelines for digital literacy

Guideline item (Pedagogical activities should....)	**Example of activities (from the text)**	**Digital literacy**	**Language skills (description and samples)**

Source: the author

This activity was elaborated based on Principle 2: The Active Character of Learning (SFORNI, 2015). Once again, this principle puts the learner at the center of the learning process and gives them an active role in it. Sforni (2015) understands that the only way learners will actually learn the concepts being taught instead of simply memorizing meaningless terms is if they are actively part of the learning process, building knowledge along with the teacher and other learners. The author also highlights that the need and motive to learn a given concept does not

necessarily exist primarily in the student, but it is created during the activity (SFORNI, 2015). In her own words,

> "Therefore, offering the content without the student being involved with the problematizations related to such content, without being inserted in the understanding of the human reasons for the elaboration of this synthesis, is similar to offering someone answers to questions they did not ask. […]. It is, therefore, necessary to create the need and the motive in the student, which means inserting them into the investigative horizon that originated the concept (DAVIDOV, 1988), having the synthesis as an abstract elaboration of the path of its elaboration." (SFORNI, 2015, p. 387)[47]

That is the first suggested teacher action for Principle 02, which refers to the "incorporation of problem-solving situations that allow the student to be inserted in the investigative horizon that first originated the concept" (SFORNI, 2015, pg. 387). We understand that "the investigative horizon that first originated the concept", is precisely what we asked the pre-service teachers to do on Activity 10.2 – reflect on how to develop digital literacy within language classes – specifically, how to incorporate digital literacy development.

We explained on the post that to fill out the first column of the chart above, students should retrieve information from the provided texts. For the other three, they could either rely on the text again or come up with answers of their own. Because this class was also asynchronous, indicating the texts and providing a model through the chart was the way we found to try and work within the Zone of Proximal Development of the group.

The final result of this activity was very similar for every group. The charts handed in were very similar because all of the groups focused on finding information to complete the chart from the text in all three columns; Group 3's chart was slightly different from the others, but it still only contained information taken from the texts. These charts containing the guidelines created can be found in the Annexes section of this dissertation.

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47 "Portanto, oferecer o conteúdo sem que o aluno esteja envolvido com as problematizações relacionadas a tal conteúdo, sem que esteja inserido na compreensão das razões humanas da elaboração dessa síntese, assemelha-se a oferecer a alguém respostas a perguntas que não fez. […]. É, portanto, necessário criar a necessidade e o motivo no estudante, o que significa inseri-lo no horizonte investigativo que deu origem ao conceito (DAVIDOV, 1988), tendo a síntese como elaboração abstrata do percurso de sua elaboração. (SFORNI, 2015, p. 387)

Going back to the teaching actions for Principle 02, Sforni (2015) mentions the importance of “planning moments for students to dialogue with each other and prepare collective summaries, even if they are not definite” (SFORNI, 2015, pg. 387). This activity, we believe, can also be considered one of those moments. The pre-service teachers had to dialogue with each other, within their groups, to make sense of the texts and decide what and how they should write the guidelines, therefore creating a collective summary.

However, going back to Principle 01: Teaching that Promotes Development and its emphasis in the learners’ verbal expression, we realized that this activity alone would not be enough for us to analyze whether or not our pre-service teachers were mentally operating with the concept of Digital Literacy and language learning because there was not enough verbal expression from the pre-service teachers.

In terms of Digital Literacy, the process we were able to identify within this activity was that of organization: “To organize and set out digital resources in a way that will enable the solution of the problem or successful achievement of the task” (MARTIN & GRUDZIECKI, 2006, p. 257). The pre-service teachers had to *organize* the information found in the provided texts within the columns. If the pre-service teachers had created their own/new guidelines, we would have been able to identify the process of creation as well, but that was not the case here.

As much as this collective summary was important and part of the teaching actions for Principle 02 (The Active Character of Learning), we needed more to determine whether or not the pre-service teachers were mentally operating with these concepts. We needed an activity that was mediated by these concepts, that required their use; This movement of inserting new activities to see if the learners’ are mentally acting with the concepts is suggested within Principle 05: Action Mediated through the Concept, which was one of the principles that guided the planning and execution of the following classes of October 29th, November 5th, and November 12th.

4.1.1.1.1 Action mediated through concept, the conscious character of the activity and the unity between material and verbal spheres (again)

Date	**Class/Assignment Description**	**FDE Principle 03: The Conscious Character of The Activity**	**FDE Principle 04: The Unity between the Material and Verbal Spheres**	**FDE Principle 05: Action Mediated through Concept**
29/10	Asynchronous Class Assignment: create or redesign a lesson plan based on the guidelines that were created on October 22nd.	a) elaboration of activities that have the potential to promote action with the concept; b) prediction of mental actions so that the central content of the activity is the focus of the students' conscience; c) attention to the students' verbal explanations, which indicate whether they are establishing a relationship between the particular and the general." (SFORNI, 2015, p. 389)	"a) organization of activities that promote interaction between the material or materialized level (illustrative) and verbal language (spoken and written). b) use of scientific and classic texts from the respective field of knowledge." (SFORNI, 2015, p. 390).	a) Analysis of the genesis of the concept in its logical-historical aspect to seek what is the core of the concept b) Elaboration of problem-solving situations, which require students to mediate the concept c) Inclusion of new learning problems at the end of the study process to analyze whether students operate mentally with the concepts"
05/11	Asynchronous Class Assignment: create a tutorial video to explain the use of one of the digital tools mentioned in the lesson plan.			
12/11	Synchronous Class. Assignment: Reading and reflecting about Digital Literacy and Language Teaching; Re-visiting the lesson plan from the October 29th class.			
19/11	Asynchronous Class			

	Assignment: create the section “in other words”			(SFORNI, 2015, p. 392).
09/12	Last Class			

Chart 30 – October 29th to December 9th

Source: the author

As we can see on previous chart, the activities designed in the course were meant to be the didactic transposition of these two principles. On October 29th and November 12th, the pre-service teachers had to re-visit an existing lesson plan of one of the members of the group or create a new one together. In either case, it should contain goals and activities with the purpose of developing Digital Literacy. In between these classes, on the 5th of November, the assignment was the creation of a video tutorial for a digital tool. On November 19th the pre-service teachers developed the very last section of their magazine and finally, on December 9th, we wrapped up the course.

Now, I present and analyze, chronologically, each one of these activities.

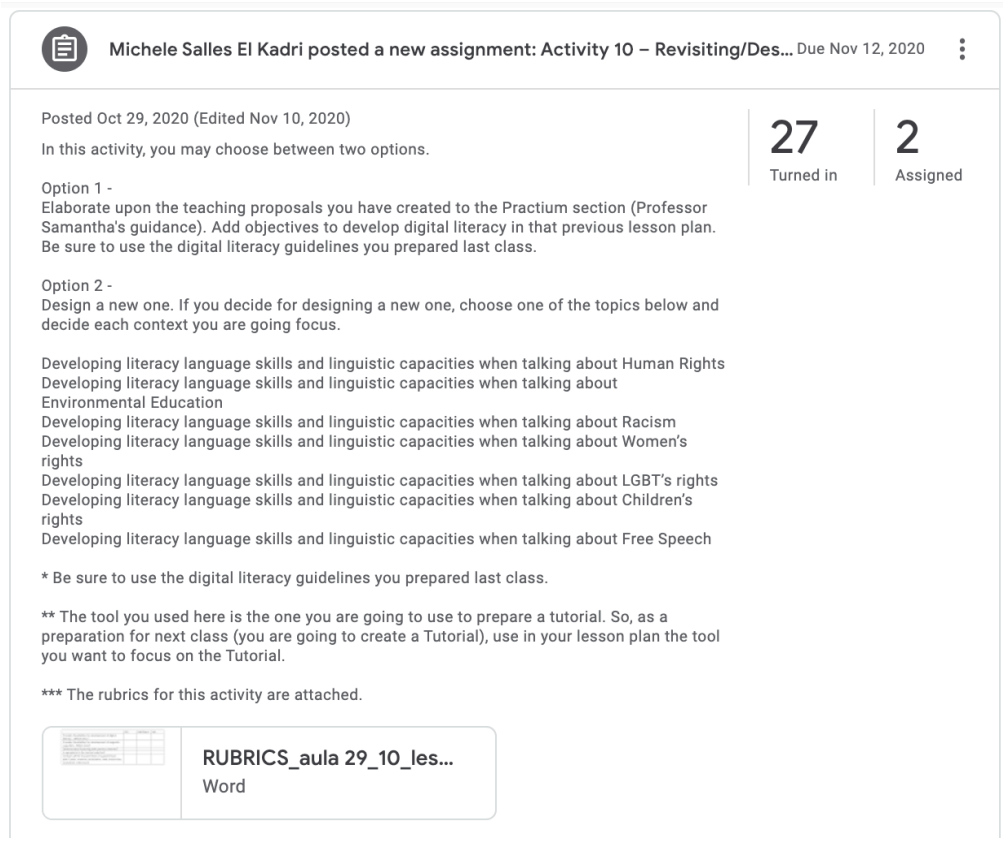
October 29th

The October 29th class was also asynchronous[48]. For this assignment, we gave the pre-service teachers a choice between revisiting a lesson plan of their own or creating a new one from scratch. The task was, regardless of which option they went for, to make sure that the lesson plan contained the development of digital literacy in its objectives, as well as planned moments and activities to achieve that. We also provided a range of topics for them to choose from if they decided to create a lesson plan from scratch, all of which were centered around various current issues.

Figure 33 – October 29th[49]

[48] For the afternoon group, this class ended up being asynchronous. We met with the pre-service teachers briefly to explain the activity, and once they understood what they were to do, the groups let us know they’d like to use the remaining class time to do the assignment, to which we agreed. We explained we would be available during that time if they had questions, and then ended the meeting.

[49] This activity is labeled as “10” due to a technical issue on Google Classroom. It was meant to be Activity 11.



Source: the author

As previously mentioned, this assignment was mainly guided by Principle 05: Action Mediated through Concept. Within this principle, among other points, Sforni (2015) explains that in order to really know if the learners are mentally acting and have learned whatever concept is being taught, it is important, during the process as well as at the end of it, to include new problem-solving activities that are mediated by the concept.

This was our goal with this assignment. We had spent the last two classes working with the concept of Digital Literacy, through the Concept Maps and the activity that required them to create guidelines for the creation of pedagogical activities that had developing Digital Literacy as a goal.

As previously mentioned, the results of these activities indicated that our pre-service teachers were mentally operating with the concepts, some more than others, but in order to be able to analyze that better, we needed to include a new activity that was mediated by the concept of Digital Literacy. Not only that, but we also needed the activity to put into motion that generalization process previously mentioned, in which the learner identifies general principles of a concept from a particular situation or vice-versa. By having both of these characteristics, according to Sforni (2015), we

would be able to find more accurate indication of whether the pre-service teachers were mentally acting with the concepts or not.

This assignment fit this purpose because it required the pre-service teachers to apply the general principles of Digital Literacy that they had been studying for the past two classes to that particular lesson plan they were working on. According to Sforni (2015), an activity like this is a great assessment tool for the teacher, because it indicates if and to what extent the learner is mentally acting with the concept.

Sforni (2015) mentions that one of the clearest indications of concept mediation is language, that is, when the way the learner talks about a certain concept changes, it could be an indication of learning. Based on that, the conclusion we reached, after looking at the lesson plans that were handed in, was that the pre-service teachers were mentally operating with the concept of digital literacy to a modest degree.

The handed in lesson plans contained activities which involved digital technologies and combined them with the development of important skills such as critical thinking and social awareness, but the Digital Literacy goals were not explicit on these lesson plans.

Figure 34 shows an example taken from the lesson plan handed in by Group 01. Their lesson plan was focused on social issues – hunger, specifically. Figure 34 shows the first page of this lesson plan, which included a contextualization of the topic and the goals of the class.

Figure 34 – Lesson Plan, Group 01, Opening Section

Universidade Estadual de Londrina

TEACHING PROPOSAL

Hunger in the world

Summary

In this teaching proposal, we aim to raise awareness, bring a reflection into the classroom through activities focused on critical thinking. The creation and problematization of hunger as a global issue is necessary when the worldwide production of food could supply the necessities of billions of people. In fact, there is a serious deficiency in the distribution of resources that guarantee access to food, especially in developing countries and areas of precarious infrastructure and connection to the urban centers.

The impacts of hunger vary from individual levels, such as health complications, to macro aspects, like the development of the economy and sociopolitical stability of a country. In this project, students will: explore the topic through media (e.g. videos, pictures, and images) to raise awareness around topics like the impacts of hunger, food waste, and different food habits around the World. Through this lesson, they will learn about how daily actions, like decreasing the family's food waste, opting for a healthier diet, and raising discussion around the issue with their peers, can help in developing awareness around hunger as a social problem.

- **Learning Goals:** develop production and listening skills; acquisition of vocabulary about food; raise awareness about hunger and food waste as a social problem.
- **Final production**: Produce digital posters using https://piktochart.com/
- **Audience**: Teenagers - Adults

Source: Activity 10

The group did include a Digital Poster as the final production of the class, but on the topic "Learning Goals", none of the listed goals for this class refers to digital literacy.

There were no indications throughout the activities either, as the figure below shows.

Figure 35 – Lesson Plan, Group 01

1. **Warm-Up - Video for Discussion**: "Hungry Planet" (15 min):

The teacher will show the video "Hungry Planet" and ask them to pay attention to which food they see that is different and also on the amount of food that it is normal to consume in each country. After that, the students will share what they think about the video and problematize the income inequality question around the world. The idea is to assist in the development of multicultural context awareness and to problematize income inequality.

Skills required - (21 century skill map)

- Communicate effectively in diverse multilingual environments.
- Articulate thoughts and ideas effectively using oral, written, and nonverbal communication skills in a variety of forms and contexts.
- Being open and responsive to new and diverse perspectives.
- Use communication for a range of purposes (e.g. to inform, instruct, motivate, and persuade).

Source: Activity 10

The image above shows the first activity of their lesson plan. This group of pre-service teachers was able to highlight the skills that each activity on their lesson plan would require from the students, and they did include digital technologies in their planning, but there are no clear indications of Digital Literacy goals.

The same is true for the figure X, which was taken from the lesson plan handed in by Group Two.

Figure 36 – Lesson Plan, Group 02

Theme: How To Be Green!

Context: Public Schools
Grade: 3rd year - High School
Time: 50min
Discipline: English
Language Level: Intermediate level
Learning Objectives: 1. Reflect upon their daily lives and how these issues affect their communities;
2. Transform their beliefs into actions;
3. Identify possible changes they can make to have a more sustainable life;
4. Provide room for reflection and argumentation.
Target Vocab: Vocabulary related to Environment (save water, recycle, turn off the lights, etc)
Materials: YouTube; Padlet; Jamboard; Camera.
Evaluation: Student's engagement in the activities.

Stage	Focus	Time Frame	Content	Procedure	Objective	Resource	Interaction
1	Focus on actions in the physical world. Hafner Et al (2015)	20'	*Warm Up: Videos about the environment*	To introduce the topic students will watch two videos. The first one talks about actions that can be done to help the environment (https://www.youtube.co	• Introduce the topic; • Contextualization; • Increase understanding of actions that can reduce the impact	YouTube	T-S S-T

Source: Activity 10

Figure 36 shows the introduction section plus the first activity of Group 02's lesson plan. This group decided to focus on environmental issues for the theme. They included different digital platforms and tools, just like Group 01, and they created a column entitled "Focus" in which they refer back to a scientific text we indicated for the guidelines activity (October 22nd). Still, just as Group 01, based on what is indicated in the lesson plan, we are not able to find indications that the concept of Digital Literacy mediated this activity. In other words, the pre-service teachers do not seem to be mentally operating with it at this stage.

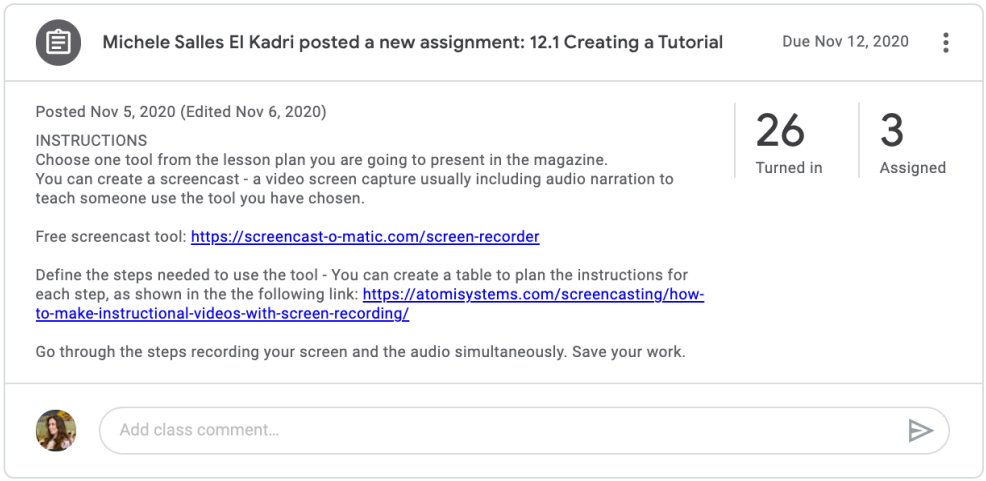
Furthermore, we were able to identify the analysis process of Digital Literacy within this activity (MARTIN & GRUDZIECKI, 2006), as the pre-service teachers had to "examine digital resources using concepts and models which will enable solution of the problem or successful achievement of the task" (MARTIN & GRUDZIECKI, 2006, p. 257). In this case, they *analyzed* and/or chose a digital tool based on the potential they thought it had to aid the development of the activities they had prepared within their lesson plans.

With this conclusion in mind, we realized that we would probably need to separate a class to revisit the Concept of Digital Literacy, explain and model ways of incorporating objectives related to Digital Literacy within the lesson plans. However, before that, there was another activity that we could use as an assessment tool of the concept of Digital Literacy, which happened on November 5th.

November 5th

There are two activities registered on Google Classroom for the November 5th class. On Activity 12.1, we asked the pre-service teachers to choose a technological tool featured in the lesson plan they were going to present in their issue of the magazine and create a tutorial for it. We suggested a free screencast tool for this activity, but, as always, did not made it a requirement. We also provided a sample planning for a screencast, so that the pre-service teachers had an idea on how to structure their tutorial.

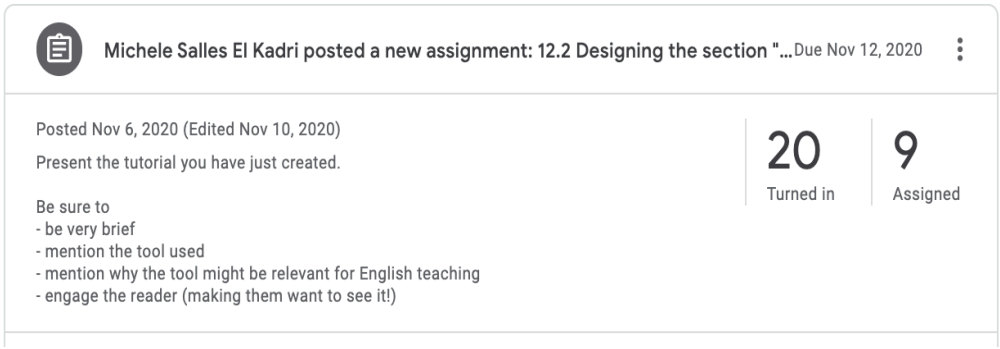
Figure 37 – November 5th Activity 12.1



Source: the author

On Activity 12.2, each group was supposed to work on an introductory text for the section Step-by-Step, that is, they were supposed to present the tutorial they had just created briefly, mentioning the tool's name and why it could be relevant for English teaching.

Figure 38 – November 5th Activity 12.2



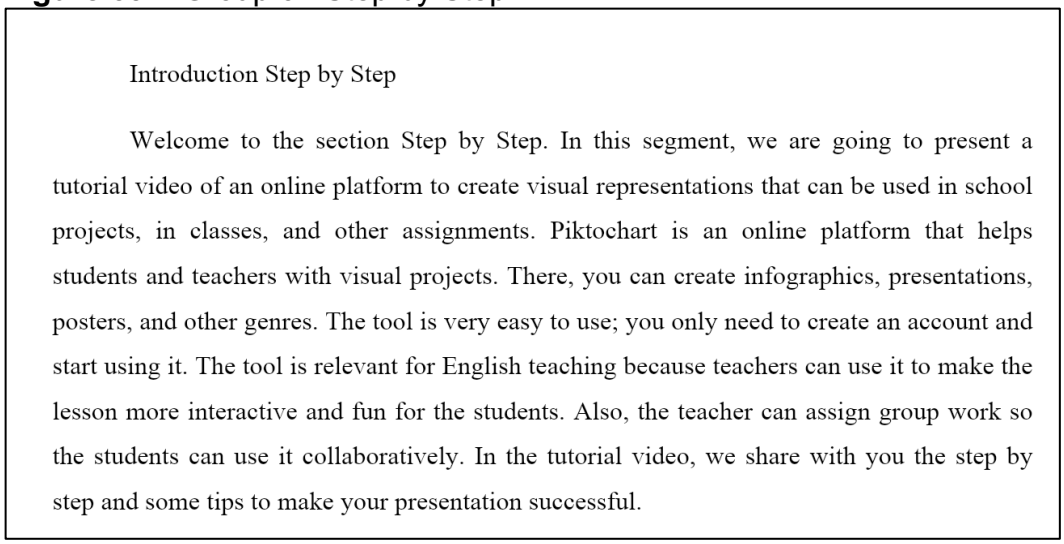
Source: the author

This activity also worked as an assessment tool of how the pre-service teachers were mentally operating with the concept of Digital Literacy because it also required them to reflect upon the principles of Digital Literacy they had been studying and figure out if and how they could be developed through the tool they were presenting. Sforni (2015) points out that this generalization movement is necessary to verify concept development, and it is the movement we tried to set in motion by asking

the groups to “mention why the tool might be relevant for English teaching” (see figure X).

The results of this activity confirmed our impressions from the previous class, which were that the pre-service teachers’ had not yet fully developed the concept of Digital Literacy. The figure below shows, as an example, the paragraph handed by one of the groups.

Figure 39 – Group 01 Step by Step



Introduction Step by Step

Welcome to the section Step by Step. In this segment, we are going to present a tutorial video of an online platform to create visual representations that can be used in school projects, in classes, and other assignments. Piktochart is an online platform that helps students and teachers with visual projects. There, you can create infographics, presentations, posters, and other genres. The tool is very easy to use; you only need to create an account and start using it. The tool is relevant for English teaching because teachers can use it to make the lesson more interactive and fun for the students. Also, the teacher can assign group work so the students can use it collaboratively. In the tutorial video, we share with you the step by step and some tips to make your presentation successful.

Source: Activity 12.2 (Google Classroom)

As mentioned before, Sforni (2015) places a very heavy amount of importance to verbal expression when it comes to analyzing whether or not learners are mentally operating with a given concept, if it is being developed. Based on that paragraph, we are not able to affirm that that was the case with group 01. Even though the group mentions why the tool could be relevant for English teaching, the listed reasons do not include the concept of Digital Literacy or other concepts related to it.

The same is true for the following example.

Figure 40 – Group 02 Step by Step

DO YOU KNOW WHAT PADLET IS?

In this section, we are going to introduce and explain how to use the Padlet tool. Padlet allows you to create virtual boards that can fit to your needs, whether is an online forum, cronograms, or even a timeline. One of the great benefits of this tool is that it can be used to increase group work, since you are able to share your Padlet with others. This tool can be relevant for English teaching because students can practice their writing in a collaborative way. In the following tutorial, you will learn more about this amazing tool and how you can use it!

Source: Activity 12.2 (Google Classroom)

Once again, there is an indication as to how the chosen tool can be relevant for English teaching, but there are no references to the concept of Digital Literacy, no indication that the pre-service teachers engaged in the generalization movement mentioned previously.

Therefore, we decided to separate the following class (November 12th) to lead the pre-service teachers to revisit and reflect some more on the concept of Digital Literacy and its didactic transposition. This flexibility of adjusting the planning after an assessment is a characteristic of the Formative Didactic Experiment, and it is partly why we believe it is an effective tool to organize teaching in a way that fosters learning *besides* being an effective research method.

Regarding the processes of Digital Literacy (MARTIN & GRUDZIECKI, 2006), within the creation of the Tutorial, it is possible to identify, once again, the same three processes of the other activities which required the creation of something (MARTIN & GRUDZIECKI, 2006) which were: identification, accession, and creation.

However, in the case of this activity, we were also able to identify the synthesis process. Martin & Grudziecki (2006, p. 257) define this process as follows: “to recombine digital resources in new ways which will enable solution of the problem or successful achievement of the task”.

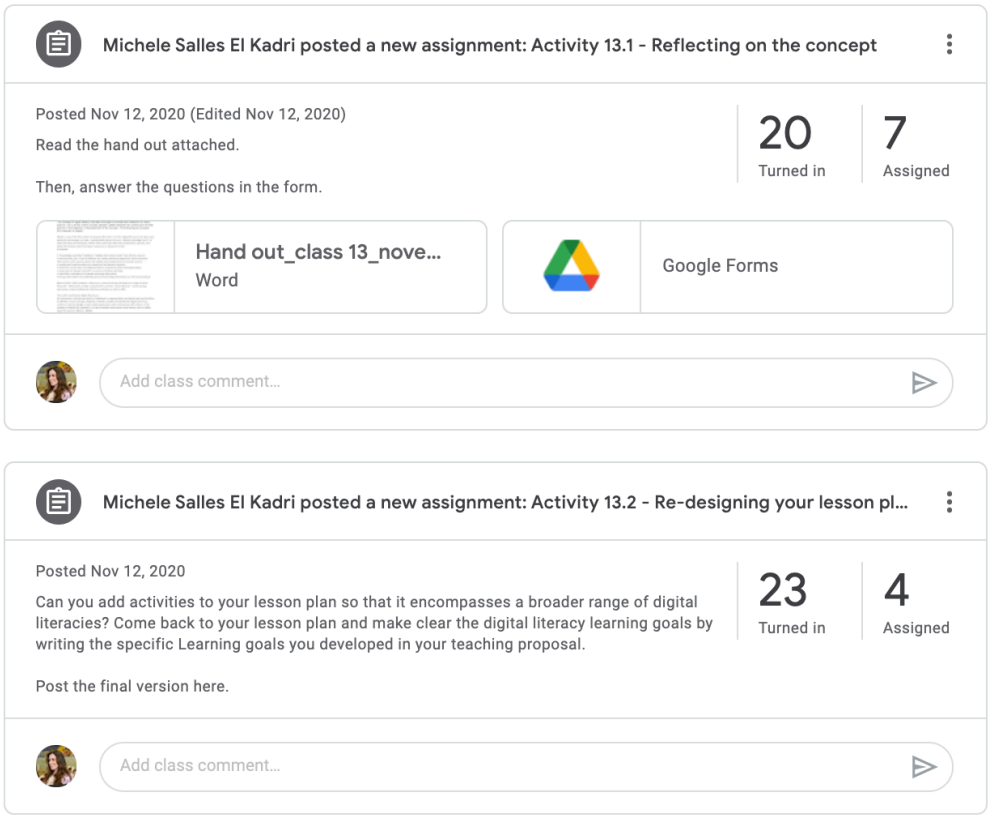
The pre-service teachers had to identify and access a tool to develop a tutorial on another tool, incorporating (or combining) both together to create something new.

November 12th

As previously mentioned, the activities proposed for this class came from an analysis of what our pre-service teachers had developed during the previous two classes. On those occasions, it was made clear to us that we needed to dive deeper into the concept of Digital Literacy, because the handed in activities demonstrated that there was still room to further develop the concept.

So, we elaborated two activities to rectify that situation.

Figure 41 – November 12th



Source: the author.

Firstly, following principles four and five - The Unity Between the Material and Verbal Spheres and Action Mediated Through Concept respectively – we relied on scientific and classic texts of the field by providing a handout to the pre-service teachers which contained a summary of a chapter on Digital Literacy written by Bawden (2008), in which he reviews the concept, its origins and history.

Still on Activity 13.1, we selected and made available, through Google Forms, a series of examples of different English learning activities involving digital technologies and digital genres. The pre-service teachers were then asked to analyze

these activities and their potential to develop features of Digital Literacy, based on the handout and the discussion we had carried around it. The last activity on this Google Form asked students to reflect upon the activities on their own lesson plans, and whether or not they had the potential for developing Digital Literacy.

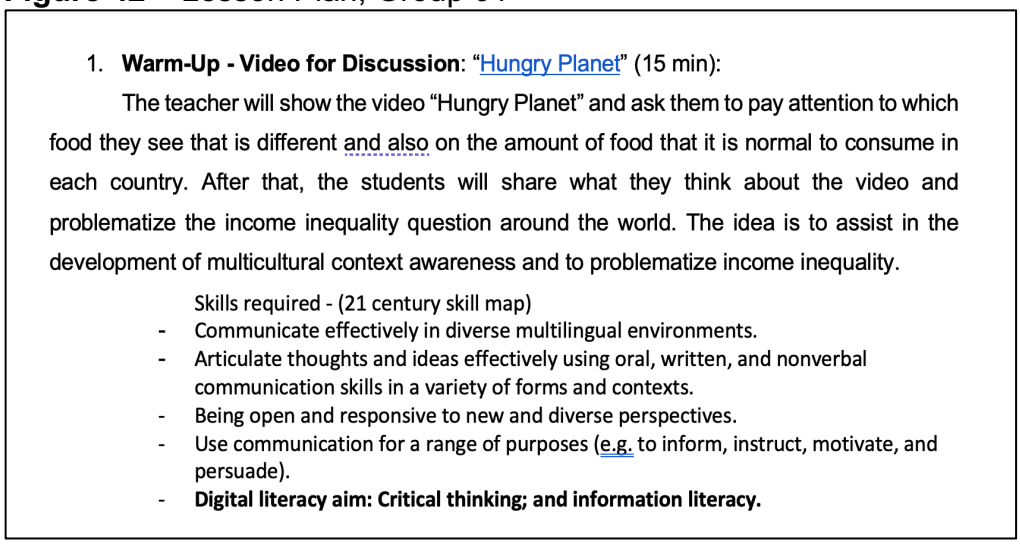
Finally, we asked the pre-service teachers to go back to their lesson plans and analyze if they had room for activities that would encompass a broader range of digital literacies. They should also make it clear which were the digital literacy goals they aimed to develop in each activity.

Both of the aforementioned activities which involve analysis are following the suggested teacher action for Principle 5: Action Mediated through Concept, which suggests the creation of problem-solving situations that require, from the learner, conceptual mediation. This is very important at this stage, because our aim was to create an opportunity for the pre-service teachers to deepen their conceptual understanding of Digital Literacy, and activities which involve conceptual mediation have great potential to do just that (SFORNI, 2015).

The changes that appeared in the lesson plans were small, but very significative.

Figure 42 below shows Group 01's lesson plan again - the same sections from the October 29th class.

Figure 42 – Lesson Plan, Group 01



1. **Warm-Up - Video for Discussion**: "Hungry Planet" (15 min):

The teacher will show the video "Hungry Planet" and ask them to pay attention to which food they see that is different and also on the amount of food that it is normal to consume in each country. After that, the students will share what they think about the video and problematize the income inequality question around the world. The idea is to assist in the development of multicultural context awareness and to problematize income inequality.

Skills required - (21 century skill map)

- Communicate effectively in diverse multilingual environments.
- Articulate thoughts and ideas effectively using oral, written, and nonverbal communication skills in a variety of forms and contexts.
- Being open and responsive to new and diverse perspectives.
- Use communication for a range of purposes (e.g. to inform, instruct, motivate, and persuade).
- **Digital literacy aim: Critical thinking; and information literacy.**

Source: the author

The group did not make any changes to the opening section, but as Figure 42 show, they did add, to each activity, the Digital Literacy development goal

that activity was aiming to reach. According to Sforni (2015), this change is significative because it is an indication of that process of generalization being set into motion: the group was able to relate general principles or skills related to the concept of Digital Literacy (critical thinking and information literacy) to each of the activities they were proposing within their group in the particular level. This is, in other words, the didactic transposition that teachers are required to do daily, but usually struggle with and are or feel unprepared for (SFORNI, 2015). Considering this course was a teacher-education course, this movement was extremely important.

The same happened within Group 02's lesson plan.

Figure 43 – Lesson Plan, Group 02

Theme: How To Be Green!

Context: Public Schools
Grade: 3rd year - High School
Time: 50min
Discipline: English
Language Level: Intermediate level
Learning Objectives: 1. Reflect upon their daily lives and how these issues affect their communities;
2. Transform their beliefs into actions;
3. Identify possible changes they can make to have a more sustainable life;
4. Provide room for reflection and argumentation.
Target Vocab: Vocabulary related to Environment (save water, recycle, turn off the lights, etc)
Materials: YouTube; Padlet; Jamboard; Camera.
Evaluation: Student's engagement in the activities.

Stage	Focus	Time Frame	Content	Procedure	Objective	Resource	Interaction	Features of Digital Literacy
1	Focus on actions in the physical world.	20'	*Warm Up: Videos about the environment*	To introduce the topic students will watch two videos. The first one talks about actions that can be done to help the environment	• Introduce the topic; • Contextualization; • Increase understanding	YouTube	T-S S-T	Information Literacy; Branching Literacy.

Source: the author

Much like Group 01, they did not change the overall learning objectives for the class, but they did add a column entitled "Features of Digital Literacy" in which they made the same generalization movement as Group 01, (SFORNI, 2015) linking general principles of Digital Literacy to the particular activities they were proposing. This is extremely important because it points towards concept development: at this stage, even if with certain limitations still, it seems that the pre-service teachers had begun operating mentally with the concept, as it started to truly mediate problem-solving activities such as this one (SFORNI, 2015).

Furthermore, we were able to identify the analysis process of Digital Literacy within this activity (MARTIN & GRUDZIECKI, 2006) once again, because the pre-service teachers had to "examine digital resources using concepts and models which will enable solution of the problem or successful achievement of the task" (MARTIN & GRUDZIECKI, 2006, p. 257) again, but this time they were able to reach a deeper level of analysis then they had previously done.

November 19th

For the asynchronous class on November 19th, the assignment was the development of the magazine section "In Other Words".

This development involved two steps: first, the pre-service teachers should pick a theme and read the article that we suggested for that theme; Next, they should write the section itself, in which they would "translate" the text: they were supposed to paraphrase the article using their own words, so that the language and the overall message were more accessible to the reader.

This section and this activity were mostly guided by Principle Four: The Unity Between the Material and Verbal Spheres. Within this principle, Sforni (2015) highlights the important role of scientific text play in the development of concepts. In her own words,

> "Students' reading of scientific texts is fundamental so that the provisional syntheses, resulting from discussions with the group about the triggering learning problem, are expanded and advance towards understanding and using the language specific to the area of knowledge being discussed" (SFORNI, 2015, p. 390)[50]

Following this principle, it is our understanding that for the pre-service teachers to be able to "translate" scientific texts related to Digital Literacy into a more "everyday" language, or, that is, to be able to perform didactic transposition, it is necessary that they understand the concepts being discussed within the scientific text. In that case, being able to complete the activity successfully – that is, do the

[50] Originally,

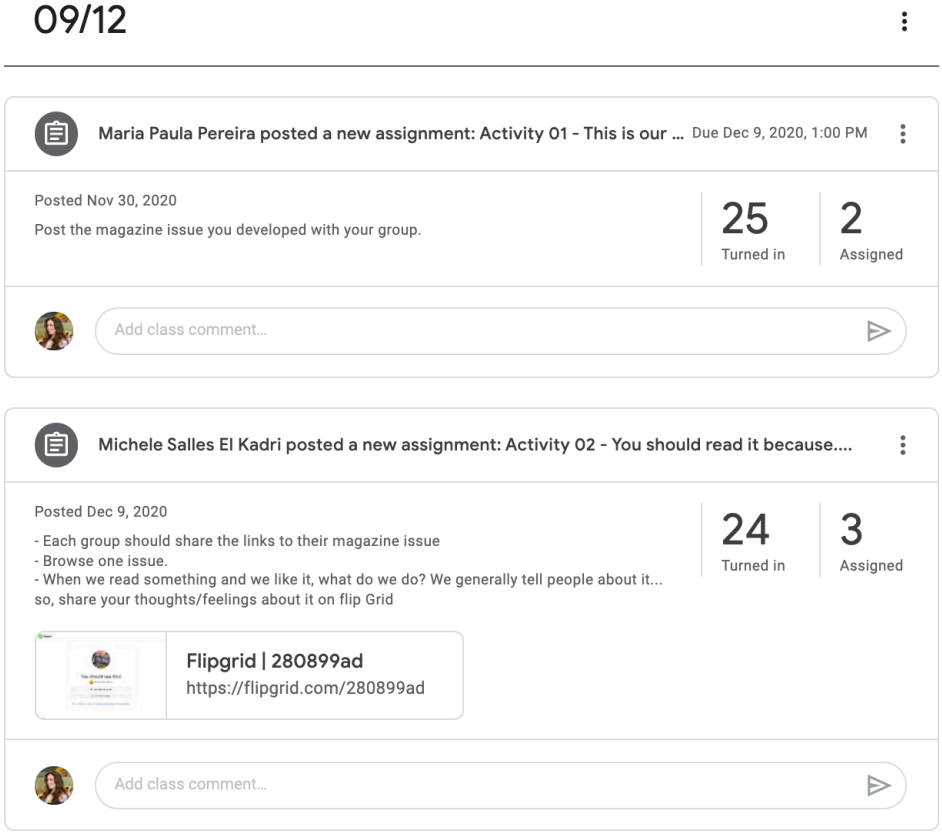
> "A leitura de textos científicos pelos estudantes é fundamental para que as sínteses provisórias, resultantes das discussões com o grupo acerca do problema desencadeador de aprendizagem, sejam amplia- das e avancem na direção da compreensão e do uso da linguagem própria da área de conhecimento em pauta." (SFORNI, 2015, p. 390)

“translation” of the concepts – then that can be an indication of conceptual development. It is our understanding that this activity can be linked to the interpretation process of Digital Literacy: “to understand the meaning conveyed by a digital resource” (MARTIN & GRUDZIECKI, 2006, p. 257). The digital resource, in this case, would be the provided PDFs.

December 9th [51]

This was the very last class of our course, and there are four activities registered on Google Classroom on this day.

Figure 44 – December 9th Activities 01 and 02



Source: the author

Activity 01 required the pre-service teachers to post the magazine issue they had developed with their group (the final, complete version).

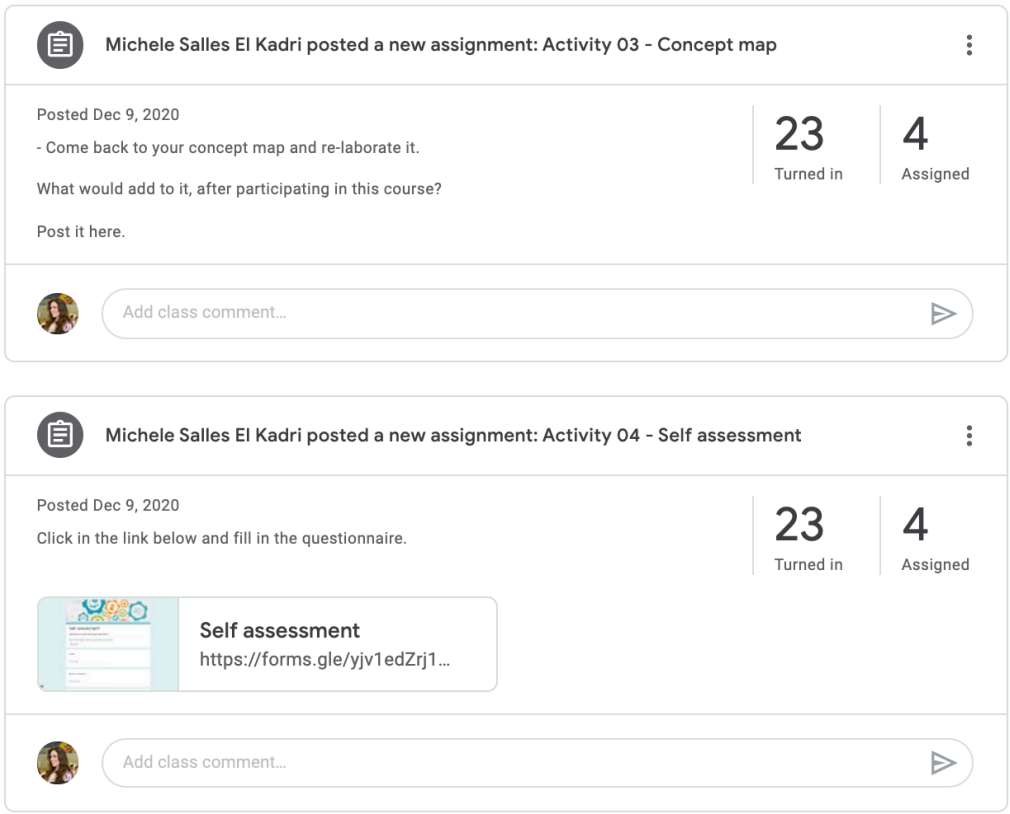
[51] There were no classes on December 3rd because the pre-service teachers had an engagement in another course which could not be cancelled or re-scheduled, so we agreed to postpone the class.

Activity 02 asked them to choose an issue produced by a colleague and browse through it. Once they finished reading, they should share their thoughts on a Flipgrid page we created for this occasion specifically.

Within these first two activities, it is possible to identify the process of Digital Literacy referred to as dissemination and defined as the presentation of "solutions or outputs to relevant others" (MARTIN & GRUDZIECKI, 2006, p. 257). This was one of the processes of Digital Literacy that was actually set into motion throughout the entirety of the Experiment, but here it is specifically and directly related to the task that was *stated* at the beginning of the course, which was the creation of the magazine.

Activities 03 and 04, shown in the figure below, were two different kinds of self-assessment.

Figure 45 – December 9th Activities 03 and 04



Source: the author

There was a mistake on our part on Activity 03. The idea for this activity was to ask that the pre-service teachers re-visit the Mind Map they had developed on the very first asynchronous class of the course. They were supposed to reflect upon

whether they'd change or add anything to it after having studied through the whole course, and if so, they should do it and upload the final version once they were done.

However, because there was so much going on at the time, we ended up mistakenly writing "Concept Map" on the activity, and none of us noticed the mistake until this analysis was carried out. As a consequence, most of the pre-service teachers referred to the Concept Map they'd created on Digital Literacy based on the texts we provided (October 8th).

The principle that guided this activity was Principle 05: Action Mediated through Concept, which suggests the "inclusion of new learning problems at the end of the study process to analyze whether students operate mentally with the concepts" (SFORNI, 2015, p. 392). We were hoping that if there were differences between the two versions of the *Mind* Maps, these differences would point towards learning and/or development. But, given this misunderstanding, the purpose of this activity was compromised.

Finally, activity 04 contained a Google Forms' Self-assessment questionnaire, which we elaborated based on Principle 03: The Conscious Character of the Activity, which, as previously seen, emphasizes the importance of the learners' verbal explanations (SFORNI, 2015). Because Sforni (2015) understands that language – what the learner says – is the best way to assess conceptual mediation and development, we understood that the questionnaire would be an effective way of assessing and registering the pre-service teachers' journey throughout the course and the FDE. The questionnaire is linked in the appendixes section (Appendix A).

From this questionnaire, two questions (and their answers) stood out:

Chart 31 – Developing guidelines for digital literacy

Questions
Entendendo aprendizagem como transformação identitária - que significa uma mudança nos modos de agir, interagir e ser - comente sobre sua aprendizagem nesta disciplina.
Houve alguma mudança de percepção sobre o uso de tecnologias educacionais no ensino de línguas? Comente.

Source: the author.

The first question is analyzed in an article written by us (EL KADRI et al., 2021) entitled “EXPERIÊNCIA DE DOCÊNCIA E PESQUISA NO ENSINO SUPERIOR NO CONTEXTO PANDÊMICO DA COVID-19: A DISCIPLINA DE TECNOLOGIAS EDUCACIONAIS ORGANIZADA PELO EXPERIMENTO DIDÁTICO FORMATIVO”, which was published last year in the Educação em Debate magazine.

In this article, we explain, in detail, how the answers to the first question mentioned in the chart above showed that the course “allowed the development of skills related to technology itself, to the use of technology in the classroom, to the development of collaborative work and digital literacy, and it generated changes regarding what students’ understanding of working with technology is” (EL KADRI et al., 2021, p. 168).

Below, we bring an analysis of some of the responses we got for this question.

The criteria to select these answers was the following: we will be looking at answers from pre-service teachers who answered the questioned positively and provided a comment explaining clearly what this change in their perception was.

The two main categories we were able to identify as what the pre-service teachers mentioned as a change in their perspective and the corresponding answers are shown in the charts that follow:

Chart 32 – Theoretical Expansion

Theoretical Expansion
Gabrieli Sim, como disse acima, agora passo a olhar para as possibilidades e limitações que cada ferramenta possibilita à aprendizagem dos alunos. *Luis Acredito que sim, pois agora vejo o que elas me proporcionam a mais, não simplesmente um uso.* *Barbara: Sim, na verdade pude aprender melhor os conceitos por trás do uso de tecnologias educacionais.* *Cecília: Por mais que eu já sabia um pouco sobre o uso de tecnologias no ensino, acho que a disciplina possibilitou conhecer mais sobre a trajetória da tecnologia e seu impacto na educação, junto com os skills que cada estilo de atividade possa ter.*

Acredito que usar recursos tecnológicos na sala de aula é muito importante, e uso direto com os meus alunos. *Larissa Eu já tinha participado de um grupo de pesquisa que olhava para essa questão então eu já considerava e entendia que uma impulsiona a outra, mas após trabalhar na produção da revista e da proposta de material eu tenho um entendimento mais amplo e prático do que as tecnologias possibilitam no ensino de linguas.*

Source: the author.

As shown in the answers above, these pre-service teachers' perceived that the change they went through during the course was that of a theoretical perspective, that is, that they're understanding of what Technology means and englobes within the language learning field was expanded.

It is our understanding that these answers seem to point towards some extent of conceptual learning and development since the pre-service teachers themselves recognize this expansion of their scientific understanding of the connection between (digital) technologies and language learning and teaching. Sforni (2015) considers this verbal expression of their perception on what changed after taking part in the course as extremely important, as we've seen in the analysis so far, and a crucial way of assessing concept mediation and development.

Chart 33 – Classroom Application

Classroom Application
Lais Sim. Minha percepção foi ampliada com essa disciplina. Pude passar a enxergar que há diversas ferramentas, maneiras de ensinar que eu não conhecia e que podem me ajudar muito no planejamento de aula, na elaboração de atividades. Além disso, vi que a tecnologia pode ser usada em vários contextos, só é necessário adaptar. *Izabella: Sim. Por meio da disciplina pude perceber novas formas de integrar a tecnologia na sala de aula.*

Tati: I have already used technology in my classes but there are some platforms and information I didn't know about and I'll do my best to apply them in my teaching practice. I also liked it when we were asked to answer the questions before we learned something new. It is so much more difficult but also very meaningful (teaching through questions - not sure how it's called). And I try to use that in my classes too :)

Anna: Sim, como mencionei acima eu costumava ter uma visão de que tecnologia era apenas uma ferramenta, mas agora acho que pode vir a contribuir muito nas aula, não só no modo de ensinar mas também no sentido de interesse e engajamento dos alunos.

Source: the author.

As shown in the answers above, these pre-service teachers' perceived that the change they went through during the course had to do with classroom application, that is, how this course led them to reflect and change the way they use technology as (pre-service) teachers.

In order to analyze these answers, it is important to recall here that learning is understood a form of continuous improvement (VYGOTSKY, 1994), also referred to as quantitative changes or incremental changes (GERMANOS, 2018), such as acquiring new technical skills or perfecting existing ones. Development, on the other hand, refers to a revolutionary breakthrough, a qualitative change in one's way of doing or understanding something (GERMANOS, 2018).

With that in mind, it is our understanding that these answers seem to point towards some extent of development, since, based on what the pre-service teachers mention regarding their understanding of how technology (here understood as digital tools) can be used in the classroom, it is implied that they will act differently from this course forward.

On the other hand, it is also our understanding that in order to be completely certain as to what extent these changes signify conceptual learning and development, we would need to spend more time and collect more data with the group.

Finally, in regards to Digital Literacy, it is our understanding that through the activities and assignments we were able to set into motion all of the Digital

Literacy processes from the Digital Competence level (MARTIN & GRUDZIECKI, 2006).

We can also confidently say that, because these processes were applied to the professional context of the group (language teaching and learning) we were also operating within the level of Digital Usage (MARTIN & GRUDZIECKI, 2006). According to authors Martin & Grudziecki, activity within this level (Digital Usage) is enough to describe a person or group as digitally literate.

The answers presented in both charts also seem to point that these pre-service teachers reached the level of Digital Transformation, which “is achieved when the digital usages which have been developed enable innovation and creativity, and stimulate significant change within the professional or knowledge domain” (MARTIN & GRUDZIECKI, 2006, p. 259). Change within the professional domain is what seems to be indicated in the answers from the second chart, whereas in the knowledge domain seem to be indicated within the answers on the first chart.

To conclude, in this chapter we presented the Formative Didactic Experiment we carried out, which aimed at developing the concepts of Technology and Digital Literacy within a group of pre-service English teachers in a remote learning context. We analyzed this FDE through the principles proposed by Sforni (2015), by the researcher’s perspective. Having presented the analysis, I now sum it the findings and the conclusion in the next chapter.

I now turn to the last chapter of this dissertation.

5 CONCLUSION

In this dissertation, we presented and analyzed a Formative Didactic Experiment which aimed at developing the concepts of Technology and Digital Literacy within a group of pre-service English teachers in a remote learning context.

We presented the historical context during which this research took place – the Covid-19 pandemic and the remote learning context., which caused the entirety of the research to be carried out remotely through digital resources such as Google Meet and Classroom. We presented the methodology used and the participants – a group of pre-service English teachers currently on the final two years of their undergraduate degree. We also presented a literature review on the theoretical framework of this research: Sforni's (2015) principles for fostering learning and development within an FDE and a literature review on the concept of Digital Literacy, both in Brazil and abroad.

The main goal of this research was to present a Formative Didactic Experiment designed to teach pre-service English teachers about Technology & Digital Literacy during an emergency remote teaching mode and to investigate and analyze its potential as a methodology and tool to organize and enhance the opportunities for the development of digital literacy concept.

The specific goals of this research to present a Formative Didactic Experiment by the researchers' perspective, through the principles listed by Sforni (2015) and to identify whether there was evidence of the development of the (scientific) concept of Digital Literacy within the Language Teaching field.

The Formative Didactic Experiment carried out had a total of 15 classes, 9 of which were asynchronous. The assignments and activities tended to all 5 of Sforni's (2015) Principles, although not at the same time (as the analysis showed, each phase of the experiment and the classes in it tended to either the first two or the last three principles).

These assignments and activities were planned beforehand and already with the Principles (SFORNI, 2015) in mind, but changes and re-adjustments were made when necessary. Still, these changes were also made with the goal to keep following the Principles.

We also demonstrate that the assignments and activities of the Formative Didactic Experiment were able to set into motion all of the Digital Literacy

processes from the Digital Competence level and, because they were inserted in the professional context of the group, they also achieved the Digital Usage level (MARTIN & GRUDZIECKI, 2006). Furthermore, there is evidence to suggest that some pre-service teachers were able to reach the Digital Transformation level, which requires significant professional or knowledge change (MARTIN & GRUDZIECKI, 2006).

Below, we revisit the research questions that guided this dissertation and add the answers found.

Chart 34 – Research Questions Answered

Research Questions	Findings
How was the FDE organized? What are the potentials and limitations of the formative didactic experiment in this process?	The Formative Didactic Experiment had a total of 15 classes, 9 of which were asynchronous. The assignments and activities tended to all 5 of Sforni's (2015) Principles. The FDE, when elaborated and carried out through these principles, has the potential do promote learning and development of scientific concepts through the organization of activities and assignments that aim at identifying and working within the Zone of Proximal Development, giving the learner a central and active roll in the process, and promoting as much interaction with the concept as possible.
Is there evidence of the development of the concept digital literacy in the data collected?	There is evidence to suggest that all three levels of Digital Literacy development categorized by Martin & Grudziecki (2006): Digital Competence, Digital Usage and Digital Tranformation. The evidence indicates that the first two levels were reached by the whole group, through the FDE, and the third level by a few pre-service teachers who indicated they noticed significant changes in their professional and/or knowledge domains (MARTIN & GRUDZIECKI, 2006).

Source: the author

Since Sforni's (2015) Principles and the FDE can be applied to the teaching of scientific concepts from any field of knowledge, it is our hope that this

research will help teachers from all areas to organize their classes and courses so as to promote as many opportunities for conceptual learning and development as possible.

In terms of limitations, it was our wish to analyze all of the data collected – transcripts and activities – from both the afternoon group and evening group, but we did not manage to do so, due to technical issues previously mentioned.

For me personally, this research and its findings have completely changed my perspective on how I, as a teacher, organize and plan my classes. I can confidently say that I feel much more prepared now to organize and plan activities and classes for my own students aiming at taking them to the next level of development. I believe the FDE is a tool that can also work for classroom development, and I plan on using it in classes to come. As a researcher, this experience deepened what I already knew about academic research and writing. Because I had been in research projects and groups before, I was already familiar with the general structure and steps of an academic research, but I had never developed something as long or as complex as this dissertation. It taught me how to handle and select larger amounts of data and broadened my understanding of ethical steps, which I never had to do before, such as submitting the research project to an ethics committee.

As it has been said, this research was carried out during a very challenging time for humanity in general, but also for education, because of the Covid-19 pandemic. As this research is being concluded, many discussions are arising regarding the “post-pandemic” world and especially what education will look like in it. It would be interesting to see, in future researchers, what possibilities the FDE offers within that context.

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APPENDIXES

APPENDIX A

Self-assessment Questionnaire

https://docs.google.com/forms/d/e/1FAIpQLSeJ84bKE7I2Abjypigg8OwBNC4gX5wO3e7B2rMCzWCHjd2zRQ/viewform

ANNEXES

ANNEX A - Ethics Informed Consent

Termo de Consentimento Livre e Esclarecido

FORMAÇÃO DE CONCEITOS: POTENCIALIDADES E LIMITAÇÕES DO EXPERIMENTO DIDÁTICO FORMATIVO NA FORMAÇÃO DE PROFESSORES DE INGLÊS

Prezado(a) Senhor(a):

Gostaríamos de convidá-lo (a) para participar da pesquisa "FORMAÇÃO DE CONCEITOS: POTENCIALIDADES E LIMITAÇÕES DO EXPERIMENTO DIDÁTICO FORMATIVO NA FORMAÇÃO DE PROFESSORES DE INGLÊS", a ser realizada na "Universidade Estadual de Londrina". Este projeto busca compreender como se dá a aprendizagem e desenvolvimento/formação de conceitos sobre tecnologias na formação de professores de língua inglesa, através do uso do experimento didático formativo. Assim, tem como objetivo específico (a) Investigar como se dá a formação/desenvolvimento de conceitos nesse contexto, (b) implementar e analisar as potencialidades e limitações do experimento didático formativo e (c) identificar se há indícios de aprendizagem e desenvolvimento como consequência desse processo. Sua participação é muito importante e se daria da seguinte forma: (participação e gravação das aulas). Esclarecemos que sua participação é totalmente voluntária, podendo você: recusar-se a participar, ou mesmo desistir a qualquer momento, sem que isto acarrete qualquer ônus ou prejuízo à sua pessoa. Esclarecemos, também, que suas informações serão utilizadas somente para os fins desta pesquisa e serão tratadas com o mais absoluto sigilo e confidencialidade, de modo a preservar a sua identidade. Esclarecemos ainda que as gravações das aulas serão devidamente armazenadas em ambiente digital (Google Drive) e de forma sigilosa e confidencial, podendo ser utilizadas em pesquisas futuras.

Esclarecemos ainda, que você não pagará e nem será remunerado(a) por sua participação. Garantimos, no entanto, que todas as despesas decorrentes da pesquisa serão ressarcidas, quando devidas e decorrentes especificamente de sua participação.

Espera-se que os resultados desse projeto possam contribuir para (a) a reflexão sobre organização do ensino de língua inglesa tanto na formação de professores quanto em sua prática, (b) compreensão aprofundada do processo de formação de conceitos e suas implicações, (c) reflexão e percepção aprofundada por parte de professores formadores a cerca de indício de aprendizagem e desenvolvimento e (d) expansão dos trabalhos acadêmicos na área específica.

Informamos que os riscos ocasionados podem ser de desconforto causado durante as aulas e de dificuldades técnicas por se tratarem de aulas em contexto remoto. Os riscos serão minimizados deixando o aluno livre para se retirar da pesquisa a qualquer momento. A gravação das aulas serão disponibilizadas caso qualquer participante tenha problema com contexto remoto.

Caso você tenha dúvidas ou necessite de maiores esclarecimentos poderá nos contatar (Maria Paula Pereira de Lima, mariapaulapereira.lima@gmail.com, (43) 999455459), ou procurar o Comitê de Ética em Pesquisa Envolvendo Seres Humanos da Universidade Estadual de Londrina, situado junto ao LABESC – Laboratório Escola, no Campus Universitário, telefone 3371-5455, e-mail: cep268@uel.br.

Este termo deverá ser preenchido em duas vias de igual teor, sendo uma delas devidamente preenchida, assinada e entregue à você.

Londrina, 30 de Agosto de 2020.

Pesquisador Responsável: Maria Paula Pereira de Lima
RG: 13.779.886-7

Email *

Valid email

This form is collecting emails. Change settings

NOME POR EXTENSO DO PARTICIPANTE DA PESQUISA *

Short answer text

Tendo sido devidamente esclarecido sobre os procedimentos da pesquisa, concordo em participar voluntariamente da pesquisa descrita acima. *

- ○ Sim
- ○ Não

ANNEX B
Tech Timelines

The links to the files and/or webpages of the Timelines that were presented during the September 17th class can be found here:
https://drive.google.com/drive/folders/1zm6TcxkuPpI9Nxmi3krNjvLEkwG0am6s

ANNEX C

Digital Literacy Guidelines

The links to the files containing the guidelines created by each group can be found here:

Group 01: https://docs.google.com/document/d/1e0VeB-80buiilxZ2wdVxo4h7MDd-iqE0LDFcXiP_cp8/edit

Group 2: https://docs.google.com/document/d/1-rUTH3cYIh93dUYAb5HkYMiwuploEp7sujGc7dF8AwE/edit

Group 3: https://docs.google.com/document/d/1ARvf6k-PWqk9Or-4NOEkua_-P57Wos1zQrqDKz4H3BU/edit

Group 04: https://docs.google.com/document/d/10URITvfbaBjxLtAVDk-RYodr-SLS90Ej68xYx-Mt3Nw/edit

ANNEX D

Teach Tech Magazines

The links to the files and/or webpages of the final Teach Tech Magazine issue of each group can be found here:
https://drive.google.com/drive/folders/1xmv3l6N1aw_xYRc5OytP4K2iMqjRGm7g