Critical Essay

Experience-Based Considerations for Investigating Complex and Evolving Issues Using a Longitudinal Mixed Methods Approach

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Abstract

In our modern and interconnected society, research topics can be complex and multifaceted. Engaging with them can provide valuable insights into lesser-researched phenomena and lay the foundations for a successful academic career. However, it can be challenging for researchers to organise their research when focusing on sophisticated and multilayered topics. The powerful forces of mainstreaming in most academic fields tend to emphasise and normalise narrow and cautious research questions to steer research towards established methods, such as qualitative or quantitative approaches. On the other hand, consolidated approaches may not be suitable for conveying a deep understanding of every phenomenon. In recent years, a third approach has emerged, namely mixed methods research, which combines quantitative and qualitative approaches to provide a more complete picture of complex phenomena. Though effective, mixed methods approaches leave design decisions open and require considerable effort and expertise to work with two strands of data simultaneously. Furthermore, unlike the two traditional methods, mixed methods approaches cannot rely on specific guidelines for data collection and analysis. The complexity increases when researchers seek to investigate a topic over an extended period. In such cases, they may employ a longitudinal mixed-methods approach, which typically involves multiple rounds of data collection, often three or more. This article describes the process of conducting a longitudinal mixed methods study from the researcher's perspective. It emphasises methodological considerations that may be useful to other researchers, particularly early career researchers and doctoral students. To this end, it focuses on a study reporting on videoconferencing for educational purposes during the pandemic, the results of which have already been published. Consistent with previous research, this

paper uses first-hand research as an illustrative example to discuss the broad range of decisions associated with research design, data collection procedures, data analysis, validity, reliability, and ethical considerations.

Keywords: Mixed methods designs; longitudinal research; repeated measures; procedural issues; emergency remote teaching

Introduction

"By narrowing the divide between quantitative and qualitative researchers, mixed methods research has a great potential to promote a shared responsibility in the quest for attaining accountability for educational quality. The time has come for mixed methods research".
R. Burke Johnson and Anthony J. Onwuegbuzie

In our modern and interconnected society, research topics can often be complex and multilayered (Creswell and Plano-Clark, 2017). Engaging with them can provide valuable insights into lesser-researched phenomena and lay the foundations for a successful academic career. However, they can pose significant challenges in terms of research design, research questions and methods (Pettigrew, 1990). Traditionally, researchers have felt compelled to choose between two paradigms: quantitative and qualitative. On the one hand, quantitative methods were recommended to analyse social phenomena, which should be studied in the same way as natural scientists do with physical objects of study. The researcher should be detached and collect quantitative data to test hypotheses and generalise thanks to quantitative evidence (Plano-Clark et al., 2014). On the other hand, a qualitative approach is advocated to study reality, which is diversely constructed and makes generalisations difficult, if not undesirable, as the subject is the only source of reality - and therefore research is always subjective to some extent. This approach is about collecting and analysing non-numerical data (e.g. text, video or audio) to understand concepts, opinions or experiences. It can provide deep insights into a problem or help develop new ideas for research (Creswell and Plano-Clark, 2017). The quantity versus quality debate is so contentious that some students who graduate from an educational institution and aspire to a position in academia or research feel that they must subscribe to either one school of thought or the other (Johnson and Onwuegbuzie, 2004). Moreover, the powerful forces of mainstreaming in most academic fields tend to emphasise and normalise narrow and cautious research questions in order to steer research toward established methods (Alvesson and Sandberg, 2013). Qualitative and quantitative methods are a safer choice as researchers can rely on consolidated methods and an established body of research (Streiner and Sidani, 2010).

However, traditional methods may not be the most effective approach to gaining a deep understanding of complex and multifaceted phenomena

(Plano-Clark et al., 2014). In recent years, a third approach has emerged, namely mixed methods research, which combines quantitative and qualitative approaches to obtain a more complete picture of multifaceted issues (Alvesson and Sandberg, 2013). The researcher who adopts a mixed-method approach collects and analyses qualitative and quantitative data to provide a more complete picture than if only one of the two approaches were used (Creswell and Plano-Clark, 2017). Over the past two decades, this research method has become popular, first in the humanities and social sciences and then in education (Butz and Stupinsky, 2016). Although mixed approaches can lead to a more comprehensive understanding of current issues, they encompass challenges. First, researchers cannot rely on specific guidelines for data collection and analysis, which leaves most design decisions on the table. Second, working with two types of data simultaneously requires considerable effort and expertise. Second, simultaneously working with two strands of data requires considerable effort and expertise (Searight, 2023). If researchers aim to adopt a mid-and long-term perspective, they must adopt a longitudinal approach involving different data collections and analyses. Longitudinal studies are demanding and time-consuming and raise further methodological issues.

This article reports on the use of a longitudinal mixed methods approach to investigate a complex and evolving phenomenon, namely video-mediated interaction in EFL classes during the pandemic. The focus is not on the research outcomes, which have already been published (Giacosa, 2021, 2023). Rather, the purpose of this article is to describe the background and conduct of the study itself to present and discuss methodological choices concerning an unprecedented and challenging phenomenon. The lessons learnt throughout this study can provide valuable insight into selecting the appropriate research method when the complexity of a topic requires researchers to explore and combine established methods to effectively conduct their investigation. This paper guides the reader through the various steps of identifying a research problem, formulating appropriate research questions, creating a research design, and choosing a mixed methods approach to collect and analyse qualitative and quantitative data to conduct a valid, reliable, and ethical study. Presenting the methodological choices from the researcher's perspective can be useful to other researchers, especially early-career researchers and doctoral students.

Identify a research problem and the theoretical background to an evolving and multifaceted topic

The study described in this article aimed to understand the impact of the Covid-19 pandemic on education. It soon became clear that 2020 was a turning point in the history of education. The pandemic created a 'before' and

an 'after', blurring the boundaries between traditional classrooms and online environments and opening up new ways for teachers and students to deliver and attend classes (Bozkurt et al., 2020). As the pandemic was an unforeseen phenomenon, researchers had not yet conducted in-depth studies to answer the questions raised by the sudden changes in teaching and learning, which was promising as a research gap had appeared (Raes et al. 2020). Furthermore, this widened the potential readership as teaching during the pandemic was a global experience affecting teachers worldwide, which made videoconferencing for educational purposes an interdisciplinary topic as it was not tied to a specific area. Therefore, the impact of the pandemic on education seemed to be a timely and relevant topic. The first challenge for the researcher was to select a particular aspect for investigation. On the one hand, there were no previous studies. On the other hand, it was foreseeable that an increasing number of researchers would start investigating different aspects of the pandemic. In addition, the circumstances were uncertain and the changing restrictions could affect data collection. Given her experience as an English as a Foreign Language (EFL) teacher, the researcher focused on English language teaching through videoconferencing systems. Based on previous research on teaching English in online courses (Moore, 1989; Moorhouse, Li and Walsh, 2021), interaction was identified as a relevant topic. Therefore, the study described in this article for illustrative purposes dealt with the pedagogical impact of videoconferencing on teacher- student interaction during the pandemic.

This is a multifaceted and multilayered topic involving different research areas. First, it refers to Emergency Remote Teaching (ERT), the unplanned and necessary pedagogical response to the pandemic (Bozkurt et al., 2020). It should not be confused with e-learning and e-teaching, which rely on consolidated models and research (Hodges et al., 2020; Schlesselman, 2020). As an emerging topic in education, ERT has attracted considerable research on case studies of learners' and teachers' perspectives, which have been studied separately for a short period and often involve respondents from the same university (Schlesselman, 2020; Yoon, 2020). Therefore, to conduct the study from a different perspective, the researcher collected learners' and university teachers' experiences of video-mediated L2 classes. To this end, she investigated how interactions unfold in digital classrooms by focusing on how written messages in the chat window and spoken interventions work together to sustain interaction, create meaning, and achieve mutual understanding. Secondly, the study drew on research on video-based communication as a means of interaction in classrooms involving different modes (e.g. Austin, Hampel and Kukulska-Hulme, 2017). The literature review also had to consider works on computer-mediated interaction via chat window concerning turn assignment and feedback (e.g. Berglund, 2009; Herring, 1999). Finally, in the context of classroom discourse, reference has been made to the crucial

impact of classroom interactions on student learning and the need to train teachers (Atar and Seedhouse, 2018). Due to the recent challenges of ERT, teachers need to understand how effectively to interact in an online environment (Moorhouse et al., 2021). Consequently, this aspect became the centre of the research.

To summarise, the study described in this article took the risk of investigating an unprecedented phenomenon simultaneously studied worldwide. It was crucial to quickly identify a topic of inquiry and the different aspects of interest, which required the researcher to engage with a diverse theoretical background. As different aspects were involved, it was vital to find the appropriate research questions to guide the data collection and analysis.

Write appropriate research questions

"If you are going to do research you need to be curious.
Being genuinely curious doesn't just mean
being open-minded about the answers to questions;
it also means thinking carefully about the questions
you ask in the first place.
Doing research can lead to surprising findings
that may challenge your current ideas and beliefs.
But if you are going to conduct useful research
it is important that you are open-minded about
both the questions you ask and the answers you discover".
Patrick White

The necessary identification of external and internal assumptions

When planning a study, the research questions can become a stumbling block that requires considerable rewriting until the proper wording is achieved. Research questions are the centrepiece of a study, as they determine the logic of the investigation and guide the steps that link the problem and the results (Alvesson and Sandberg, 2013). Therefore, they determine the voice of the researcher and the impact of their work. They depend on the correct identification of the key aspects of the object of study and need to be formulated in such a way that the researcher's methods of data collection and analysis can address them and provide meaningful results. In addition, before formulating their research questions, researchers must consider possible assumptions underlying their hypotheses, namely external and internal assumptions.

External assumptions refer to common places and widely held beliefs in a society (Alvesson and Sandberg, 2013). Regarding the illustrative study analysed in this article, the literature review on computer-mediated communication revealed an assumption about online interaction that could also apply to online learning. Herring (1999) pointed out that online

interaction has rules that make it a different kind of communication. When communicating via a screen, interactants should be aware that the messages appear in the chat window after pressing the enter key. So, posts do not always follow a logical sequence, which could affect coherence. However, research has shown that computer-mediated communication can still be effective, which contradicts the widely held belief that face-to-face interaction is more effective than computer-mediated interaction. During the pandemic, ERT was portrayed in the mainstream as a loss and lower quality compared to learning in the pre-pandemic era. To investigate interaction in an online emergency environment, one first had to be aware of the assumption that teaching and learning via a screen was a second-class experience during the pandemic.

Identifying mainstream assumptions helps the researcher focus on aspects to consider while planning a study as the data collected can confirm or challenge common beliefs thus making the study relevant. In the illustrative case used in this article, it appeared timely to verify whether online teaching and learning was per-se flawed or was just differently abled. In turn, this goal could contain another assumption: it assumed that online interaction could be effective and the researcher had to find evidence for that. This can be considered an *internal assumption*, namely a presumption underpinning the research questions of a study (Alvesson and Sandberg, 2013). Although unavoidable, internal assumptions must be identified to avoid undermining the quality of a study (Simon, 2011). This is a crucial step in the planning of a study, as at this stage researchers need to make decisions that may involve assumptions. For example, they need to consider where they can find data and they often formulate the questions to find answers. The decision to include a particular group of participants also depends on how easily they can be included and are willing to participate in the study (Simon, 2011). In the case analysed here, the data were collected in classes taught by participants who agreed to take part in the study. This meant that they felt safe enough to allow an observer to participate in their classes. Therefore, the sample could be biased in favour of online teaching, which could reinforce the internal assumption about the effectiveness of online learning and teaching during the pandemic. This possible bias has to be taken into account when formulating the research questions and choosing the approach for data collection and analysis.

Different steps towards relevant research questions

When focusing on a multifaceted topic, it can be challenging to formulate relevant research questions so that data collection gives the researcher meaningful insight with limited bias. As suggested in Van Efferink (2022), the main research question (MRQ) was written first, i.e. an overarching research question that clarifies what the research is trying to

achieve. Since the expected answer needs to summarise the main findings of the study, it is better to formulate it as an open question to obtain a broad perspective. Open-ended research questions introduced with "how" and "to what extent" are preferable to closed-ended questions such as yes/no questions, as they facilitate the discussion of the results and the writing of the conclusion. In the study analysed in this article, for example, the following open question was used: To what extent did video-based communication influence interactions in university EFL online courses during the pandemic outbreak? In line with previous studies on online settings (e.g. Moorhouse et al., 2021), this question assumed that online settings influenced interaction. At the same time, it allowed the researcher to limit possible biases as he used the verb 'influence', which is preferable to alternatives such as 'help' or ' challenge', which were perceived to be more biased towards online learning.

However, after formulating such broad questions, researchers may still have difficulties in deciding how to proceed concretely. Van Efferink (2022) suggests dividing the MRQ into individual sub-questions, called Contributory Research Questions (CRQs), which help the researcher answer the central research question in more 'doable' steps. They must adopt a dual perspective: on the one hand, they relate to the theoretical framework of the study and, on the other hand, they help the researcher find out what to focus on to gather relevant information to answer the MRQ. In the case of the illustrative study analysed here, three aspects of the multifaceted topic of ERT interaction were identified and examined in the CRQs: the use of the chat window (CRQ1 How was the chat used?), the role of the chat window in the interactions (CRQ2 What role did the chat window play in the IRF sequences in ERT VMI?) and the perceptions of the different interactants (CRQ3 How did the perceptions of the teachers differ from those of the students?). These CRQs helped the researcher to identify two levels of investigation: On the one hand, the focus was on interactions that needed to be collected and analysed as they took place (micro-analytic perspective). On the other hand, it was necessary to collect the perceptions of the interactants about these class interactions to gain a more comprehensive understanding (macro-analytical perspective). This awareness helped the researcher to identify how to proceed to concretely collect data. Indeed, as Van Efferink (2022) suggests, the CRQs were divided into different Operational Research Questions (ORQs) that are smaller, less abstract and useful for answering your CRQs (Contributing Research Questions) and finally the MRQ (Main Research Question), as shown in Table 1.

Table 1. Overview of the Research Questions[1]

Main Research Question (MRQ)

[1] Since these questions are for illustrative purposes, no further explanatory details are provided.

To what extent did video-based communication influence interactions in university EFL online courses during the pandemic outbreak?		
Contributory research question 1 (CRQ1) How was the chat used?	Contributory research question 2 (CRQ2) What role did the chat window play in the IRF sequences in ERT VMI?	Contributory research question 3 (CRQ3) How did the perceptions of the teachers differ from those of the students?
Operational research question (ORQ1.1) To what extent was the chat used?	Operational research question (ORQ2.1) What were the possible patterns in IRF sequences involving the chat?	Operational research question (ORQ3.1) What were the main challenges, opportunities, suggestions for interaction in teacher perception?
Operational research question (ORQ1.2) Who used the chat?	Operational research question (ORQ2.2) How were the conversational turns organised?	Operational research question (ORQ3.2) What were the main challenges, opportunities, suggestions for interaction in student perception?
Operational research question (ORQ1.3) For what purpose was the chat used?	Operational research question (ORQ2.3) To what extent did EnLL lectures differ from PrEn classes in terms of IRF sequences?	Operational research question (ORQ3.3) What were the similarities and differences between teacher and student perceptions?
Operational research question (ORQ1.4) Were there any differences in the use of the chat between EnLL lectures and PrEn classes?		Operational research question (ORQ3.4) Were there any differences between EnLL lectures and PrEn classes regarding the perception of interaction?

This process allowed the researcher to gain an overview of the focus and associated specific foci of the research and determine the strand of data to be collected. By formulating the questions, the researcher clarified the context of the study and the assumptions about video-mediated interactions that might be challenged or confirmed by the research. At the same time, this series of steps helped the researcher visualise the logic of the research and clarify the approach of the study. As the ORQs related to both quantitative and qualitative data were collected in three rounds, the researcher opted for a longitudinal mixed methods approach (as explained in Section 4). Furthermore, this

multilayered perspective facilitates both data collection and analysis and ultimately paves the way for the conclusions in which the MRQs are discussed concerning the evidence described in the findings and by challenging external assumptions.

The Research design: a mixed longitudinal approach to deal with evolving contexts

After choosing a study topic and the research questions, it is easier to determine what type of data (whether qualitative, quantitative or both) is needed to conduct the study. As both quantitative and qualitative data were needed for the questions on video mediation in pedagogical emergency remote classes, a mixed methods approach was chosen in the study analysed in this article. This choice was justified by five main reasons. Firstly, a mixed methods approach is considered suitable to describe the multilayered reality and obtain a more comprehensive picture (Creswell and Plano-Clark, 2017; Flick, 2018; Hesse-Biber, 2016). Therefore, a mixed methods approach was chosen as the most appropriate option to address the quantitative and qualitative aspects of RQs. Secondly, it contributes to better contextualisation and a more comprehensive understanding (Creswell and Plano-Clark, 2017). Third, the comparative weakness of the qualitative data collected can be mitigated by the strength of the quantitative data, which are externally valid and partially generalisable (Flick, 2018). Fourth, using different methods to collect data on the same topic can lend more credibility to your findings through triangulation (Creswell and Plano-Clark, 2017). Finally, this approach was used in studies before and during the pandemic that inspired the present case study (e.g. Butz and Stupnisky, 2016; Moorhouse et al., 2021; Moorhouse and Wong, 2021; Morse, 2010; O'Halloran et al., 2018).

According to the classification of Plano-Clark et al. (2014), this is a longitudinal study, as it repeatedly collected qualitative and quantitative data at different points in time. As shown in Figure 1, the study consisted of three rounds of data collection to observe ERT over three academic years (2019-20; 2020-21; 2021-22). It included two procedures (classroom observation and anonymous questionnaires) that were repeated each year. Data analysis was conducted through conversational and multimodal analyses of interview sequences triangulated with qualitative and quantitative data from the online surveys. This process allowed the researcher to observe the impact of Emergency Remote Education (ERT) on mid-term interactions and provide a comprehensive insight into the perceptions of teachers and students.

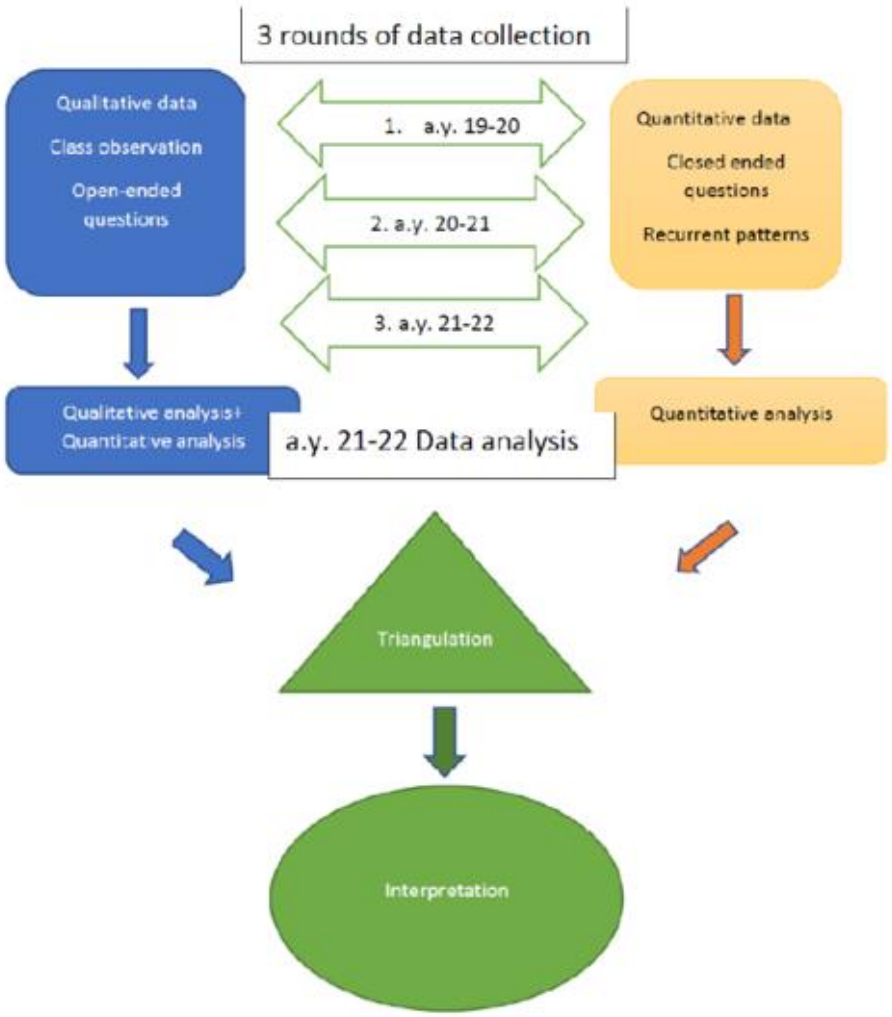

Figure 1. The research design

As highlighted in the literature on mixed longitudinal studies, this research approach is suited to investigate complex issues but does not draw on clear guidelines and presents the researcher with considerable demands. For example, researchers using this design face numerous issues regarding the integration of the quantitative, qualitative, and temporal components. This impacts various aspects of the research such as recruitment, dynamic sample sizes, attrition, complex data collection procedures, integration challenges, feasibility challenges, and reporting challenges (Pettigrew, 1990; Plano-Clark et al., 2014).

How to choose and apply a mixed method approach

As described in methodology books, mixed methods studies can use three different research designs: the explanatory sequential design, the exploratory sequential design and the convergent parallel design. The explanatory sequential design and the exploratory sequential design are flexible methods in which one type of preliminary data (quantitative for the former and qualitative for the latter) is collected and analysed and then another type of data (qualitative and quantitative, respectively) is collected and analysed, leading to interpretation (McBride et al., 2019). Sequential mixed methods studies provide researchers with a flexible tool to report on changing phenomena, but given the two separate phases, they require time to complete the entire data collection. Although the sequential mixed methods approach enabled researchers to address rapidly evolving Covid-19 emergency and unplanned changes in the education system, they required qualitative and quantitative data to be collected and analysed separately in a specific order. They were also used to examine specific aspects of videoconferencing during the pandemic over a limited period (e.g., Kessler, Loewen, and Trego, 2020; Moorhouse et al, 2021; Moorhouse and Wong, 2021).

By contrast, in a study using a convergent parallel design, qualitative and quantitative data are collected simultaneously and independently at one point in the study (Creswell and Plano-Clark, 2017; Riazi and Candlin, 2014). This approach was chosen for the study described in this article, as equal importance was attached to quantitative and qualitative data during data collection and analysis. It can be defined as a QUAL+ QUANT study, with capital letters indicating that qualitative and quantitative data are considered equally important (Butz and Stupnisky, 2016). It was chosen to simultaneously collect quantitative and qualitative data, which were analysed separately and combined into an overall interpretation (Creswell and Plano-Clark, 2017). A longitudinal convergent parallel mixed methods approach was chosen as the two strands of data allowed for a more comprehensive understanding of the topic and made the results more reliable. However, such an approach requires considerable effort and expertise as the researcher has to work with two strands of data stemming from different data collections. The combination of the qualitative and quantitative strands with the temporal aspect required the researcher to consider possible difficulties in data collection and analysis.

Main issues to deal with while adopting a mixed-longitudinal approach

Doing longitudinal research in a fast changeable context

The rapidly changing context was the first problem of the longitudinal study analysed in this article. During the three academic years affected by the pandemic, the changing regulations to contain the virus determined different learning environments that could change almost overnight. The settings the

researcher had to observe were online only, asynchronous only, synchronous online, synchronous hybrid, and a combination of these, as shown in Table 2.

Table 2: Overview of the teaching environments investigate in the study

Stage A (a.y. 19-20)	Stage B (a.y. 20-21)	Stage C (a.y. 21-22)
100% synchronous online teaching	80% synchronous online 20% synchronous hybrid	20% synchronous online 80% synchronous hybrid

This required the researcher to be flexible and consider different contexts in which teaching settings were represented in varying proportions. In line with research on longitudinal mixed methods studies (Plano-Clark et al. 2014), a detailed description of the new communicative environment and its possibilities was considered crucial, in line with studies on video-mediated communication, to provide a clearer understanding of the setting (e.g. Çelik, Baran and Sert, 2018; Recktenwald, 2017). In addition to a detailed description of the virtual classroom, it is useful to collect and provide visual material to make the data presentation and discussion more interesting, as shown in Figure 2.

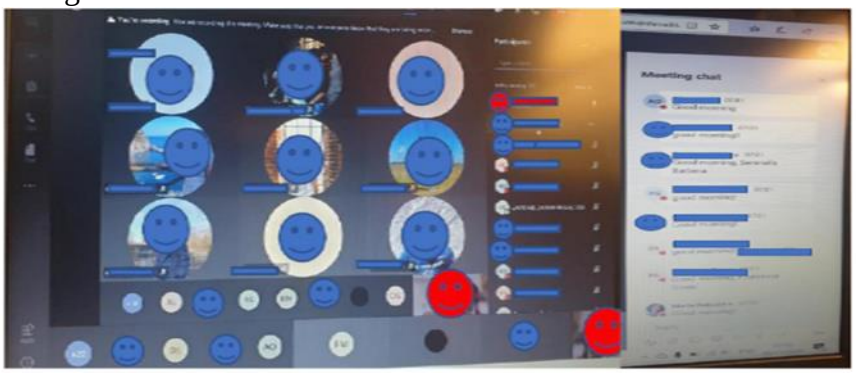

Figure 2. Example of virtual classroom

The participants in longitudinal studies: recruitment, dynamic sample sizes, attrition

Like previous studies on interaction, the study analysed in this article also chose the specimen perspective, which examines the participants (teachers and students) in their natural context (Butz and Stupnisky, 2016; Hesse-Biber, 2016). At the beginning of the pandemic, teachers of the target courses were selected on the official websites of several Italian universities to obtain a large sample of ERT courses taught with different videoconferencing tools. Of the over 300 teachers contacted, 31 agreed to participate in the study. As for the students, three different cohorts were included in the three rounds of data collection.

Over the three years of investigation, a few participants changed. The researcher managed to keep the number of participating teachers stable by replacing those who withdrew with others from a similar background. Although this solution was not entirely satisfactory, it helped to pursue the aim of the study. Regarding the number of students participating, there was a significant decrease in the number of students who referred to one of the two types of courses considered in the study, as can be seen in Figure 3. This was due to the fact that the number of face-to-face courses increased before the start of the last round of data collection, which led to the exclusion of these courses from the study. However, more than 100 students participated in each phase of the study, so the sample size is representative according to the guidelines for mixed methods and observational studies (Sandelowski, 1995).

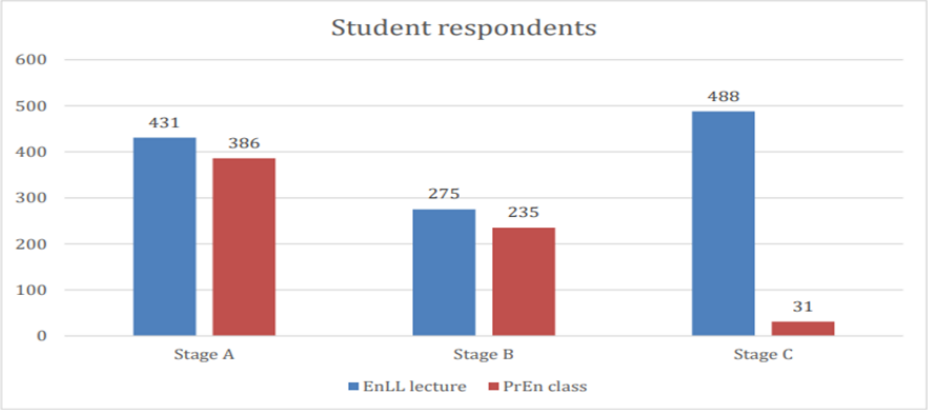

Figure 3. Student respondents- overview

The variation in sample size had to be reported as a possible limitation of the study and considered when discussing the results. In addition, the researcher had to deal with another issue related to participants in a longitudinal study, namely attrition. This term refers to the risk of collecting results based only on a sample of individuals who did not choose to leave the study (Flick, 2018). This potential bias only affected one type of participant, namely teachers, as the student participants belonged to different cohorts and changed every year. To address this issue, the choice of a mixed methods approach with different types of participants (namely students and teachers) and methods of data collection and analysis seemed appropriate.

Methods of data collection regarding videoconferencing

According to Lewinski *et al.* (2019), videoconferencing is uniquely capable of collecting qualitative data on real-time interactions between individuals. However, they pose challenges for researchers. Firstly, it is a new media genre that combines the broadcasting of an activity with cross-modal

video-mediated communication (Recktenwald, 2017). Secondly, the sudden transition to digital platforms, the lack of familiarity of many students and teachers with the teaching tools, technological issues and changing regulations affect teaching. Thirdly, as Recktenwald (2017) points out, online interaction has mainly been studied through chat rooms or instant messaging, while more sophisticated platforms are a relatively new area of research to explore.

Moreover, researchers have to tailor their data collection to the characteristics of the videoconferencing tool they want to study (Due and Licoppe, 2020). Previous research can be helpful, but the increasingly new functionalities and context-specificity of the tools require the observer to adapt to the specificities of the digital environment (Austin et al., 2017). Due to the peculiarities of video-based settings, two methods of data collection were chosen in the study described here, namely direct observation of online classes and online questionnaires.

Direct observation

To gain insights into the dynamics in the natural context from the dual perspective of the student and the teacher, the researcher chose open observation. In this method, one is present as both an observer and a participant and the other participants are aware that they are being observed for research purposes (Flick, 2018; Kawulich, 2012). Direct observation is a suitable method for data collection because it enables a better perception of the context under investigation. While participating in the online course as a participant, the researcher could understand the participants' world by collecting information about the context and actively engaging in the activities in which the participants were involved (e.g., by reading the materials shared and explained by an instructor). Furthermore, direct observation was chosen in line with studies on classroom interaction skills that use participant observation as the most appropriate method of data collection (e.g. Berglund, 2009).

Despite the advantages, this method also has disadvantages. For example, participants might not act spontaneously due to the presence of an observer, the so-called observer's paradox (Berruto and Cerutti, 2018). To address this issue, neither teachers nor students were informed that the focus of the observation was on the interactions in the chat. Moreover, the researcher prepared a grid for collecting field notes. They are widely recommended as an essential component of rigorous qualitative research and as a means of enhancing the data and documenting the contextual information needed (Creswell and Plano-Clark, 2017; Kawulich, 2012; Phillippi and Lauderdale, 2018). On the one hand, the choice of field notes was partly due to the fact that the universities involved in the research did not allow the recording of lessons. On the other hand, field notes provided a better insight into the context,

increased the rigour and reliability of the study and integrated the data from the questionnaires (Creswell and Plano-Clark, 2017; Kawulich, 2012; Phillippi and Lauderdale, 2018). Photographs helped the researcher to fill in missing details in the field notes. Finally, the observer followed an established procedure when observing the classes.

At the beginning of the lesson, the researcher was introduced to the participants, who had already been informed of the presence of an observer and agreed to participate in an observed lesson. The observer filled in a grid to collect general information about the setting and took notes on the interactions between the teacher and the students by writing down the verbal interventions and copying and pasting messages from the chat window into the field notes. At the end of the lesson, the researcher sent the teachers the link to the student-teacher questionnaire (see 5.2). Later, the field notes were integrated with photographs taken during the lesson to provide information about the context after anonymising all personal data.

This procedure yielded two datasets. Dataset 1 refers to all field notes taken during the lesson observations and later annotated and anonymised. This dataset provides a qualitative overview of how classroom interaction developed during the online lessons in terms of speakers, the distribution of verbal messages and the chosen modes of communication. By contrast, Dataset 2 was created using a non-probability sampling technique. In this method, units are selected from a population using a subjective (i.e. non-random) method. It is often used in exploratory and qualitative research, as the aim is not to test a hypothesis about a broad population but to develop an initial understanding of a small or under-researched population (Amini Farsani and Babaii, 2020). In the case of the illustrative study, a sample of 22.5 hours was prepared to facilitate microanalysis, which is a time-consuming technique as explained in the data analysis.

Questionnaires

The second method of data collection used in the illustrative study is the questionnaire, which gathers generalisable, externally valid information. Firstly, it is a convenient method to collect large amounts of data, which increases the reliability of the results. It proves particularly useful in data triangulation to compensate for the inevitable subjective data from participant observation. Secondly, it allows the researcher to conveniently reach geographically dispersed and hard-to-reach respondents. Thirdly, respondents are able to respond at their own pace and in their own time, allowing them to provide well-thought-out answers. Fourth, it shows the exact words respondents used to express their opinions. Fifth, it provides both quantitative and qualitative data, which is critical to the mixed methods approach in this study. Finally, it is a method of data collection in previous studies on video-

mediated interaction (e.g., Butz and Stupnisky, 2016) and studies on synchronous online and hybrid environments during the Covid-19 pandemic (e.g., Moorhouse and Wong, 2021; Yoon, 2020).

Though useful, questionnaires have possible disadvantages, such as the unpredictable response rate. In the study analysed in this article, a satisfactory response rate could be expected from the teachers: once they agreed to participate in the study, it was likely that they would fulfil the research requirements. In contrast, the student response rate was less predictable. To address this issue, the researcher introduced the study to the students at the beginning of the lesson and emphasised the importance of obtaining students' feedback to improve ERT. In addition, several teachers were involved and observed to increase the number of potential respondents.

Another potential disadvantage of questionnaires is that the questions cannot be changed during data collection to ensure consistent results. This possible issue was addressed by creating a pilot questionnaire for each research phase to identify weak or unclear questions with the help of other researchers. In addition, this study relies on three questionnaires that allowed the development of the ERT to be tracked and to focus on the relevant aspects of the different phases of the educational response to the pandemic. Closed-ended questions could compromise the ability to gather detailed information about the context or perceptions of respondents. To address this issue, on average 75% of closed questions allowed the respondent to select more than one option. Furthermore, many questions were followed by open-ended questions to collect specific personal comments. The questionnaires required 15-20 minutes to complete, which could negatively impact the response rate. To solve this problem, it was decided not to make answers compulsory, but to give respondents the option to skip a question if they did not want to answer it. This could lead to an imbalance in the percentages, which can be partially compensated with observations collected during the online classes. This procedure yielded a third dataset (Dataset 3) with a total of 2,038 responses, which contained quantitative and qualitative data to be triangulated with Dataset 1 and Dataset 2.

Methods of data analysis

In studies using a convergent parallel design for a longitudinal mixed methods approach, the qualitative and quantitative data derived from different rounds of data collection need to be simultaneously analysed and triangulated (Flick, 2018; Hesse-Biber, 2016). The complexity of this method poses challenges to the researcher as different datasets of qualitative and quantitative data are analysed in relation to time. As suggested by Plano-Clark et al. (2014), researchers have to find how to incorporate the longitudinal component when integrating the quantitative and qualitative findings. The literature on various

longitudinal mixed methods studies shows that various procedures can combine quantitative and qualitative data. One option is to develop typologies by identifying patterns within longitudinal research. In addition, working with different datasets facilitates data triangulation. Triangulation is now seen less as a validation strategy in qualitative research and more as a strategy to justify and substantiate knowledge by gaining additional insights (Flick, 2018).

In the illustrative study analysed in this article, the datasets were evaluated using different methods. Dataset 1, which contained information collected during the classroom observations, was analysed quantitatively in terms of participants, verbal or written interactions in the chat, chat users, messages related to technical problems or active participation. This enabled the researcher to answer CRQ1 and its sub-questions. Dataset 2, which consisted of sequences of interactions, was analysed qualitatively from the perspective of conversation analysis (CA) and enriched through multimodal analysis (e.g. Atar and Seedhouse, 2018). The study applied the so-called "unmotivated gaze", “an analytical perspective that does not pursue any predetermined analytical goals but initially notes inconspicuous features of the conversation or other behaviour” (Schegloff, 1996: 172). This approach to the data is widely used in CA work as an effective method for uncovering trustworthy and relevant aspects of conversations in the interaction (e.g. Jenks, 2021). This method was useful to answer CRQ2 and its sub-questions. Qualitative and quantitative data from Dataset 3, which came from the online questionnaires, were triangulated with the results of the analyses of Dataset 1 and Dataset 2 to answer CRQ3. This process enabled the researcher to provide valid and reliable results.

Validity and reliability

Data reliability and *validity* are crucial aspects of research. Data are reliable when the results can be reproduced under the same conditions. Data are valid when they are accurate and the results represent what they are supposed to measure (Flick, 2018). In this respect, an issue of concern regards data *representativeness*, namely the quality of mirroring the research target population, which requires a diverse sample (Creswell and Plano-Clark, 2017). As mentioned, researchers conducting longitudinal studies must be aware of the possibility that participants may withdraw, which could compromise the purpose of the study. At the same time, they need to consider attrition, i.e. the risk of collecting results based only on a sample of people who did not choose to drop out (Flick, 2018).

To address these methodological issues, specific strategies were employed in the study analysed in this article. To collect a diverse sample, 14 Italian universities located in different Italian regions were involved. Clear inclusion criteria were established to have a diverse but still representative

sample. Only EFL teachers who taught asynchronous, synchronous online and hybrid courses were included. The participants were randomly selected from the institutional web pages so that different kinds of EFL courses could be represented. As the investigation relied on three years of data collection, the researcher selected other teacher informants with the same characteristics as the previous participants to replace the participants who stopped collaborating. A longitudinal approach requires the context to be the same in the different rounds of data collection. Therefore, when participants returned to teach only face-to-face classes, they were excluded and replaced. In line with recommendations of previous longitudinal research, this was clearly stated in the description of the participants and taken into account when presenting and discussing the data (McBride et al., 2019). Regarding the students, they volunteered to fill in anonymous questionnaires, which increased the representativeness of the data in line with the guidelines on validity (Hesse-Biber, 2016).

Strict data collection and analysis procedures were established and followed based on extensive research on methodological issues and previous case studies (Philippi and Lauderdale, 2018). The researcher observed directly online classes, as a study is reliable if the participants experienced the events investigated in the study as real events, even if they were aware of the presence of an observer. To obtain a consistent dataset, the same observer conducted data collection and analysis using the same procedures in all three phases examined in this study. As the amount of data was large, rigorous non-probability sampling methods were used to create smaller, more manageable, but still representative datasets. Finally, the methodology and results were presented in different contexts to obtain insightful feedback from other researchers and reviewers, which helped identify methodological concerns and solutions.

Ethical considerations

Recently, the massive use of digital communication platforms such as Zoom, Skype and Facebook for research purposes has forced researchers to question and rethink their research approaches. This has shown the need to reconsider participant safety and ethical integrity in online research (Howlett, 2021; Recktenwald, 2017). When studying online contexts, the guidelines of the Association of Internet Researchers (Franzke et al., 2020) should be followed. If researchers are interested in collecting data on online interactions through direct observation, they should ask for official permission. Moreover, they have to protect the identity of individual subjects when collecting personally identifiable information (PID) and/or sensitive data. However, online classes are semi-public spaces where participants can easily join or

leave while maintaining their anonymity, which makes asking for individual informed consent impractical.

For the study described in this paper, the researcher first contacted the participating teachers by email to introduce them to the project and explain what would be required of them if they agreed to participate. After reading the project description, the staff allowed the researcher to participate in the online lessons. The researcher was asked not to record the online lessons, but permission was given to take photographs, provided that all personal details of the participants were deleted. The students were informed of the researcher's presence and had to agree to participate in the lesson. When the teacher started recording, the students also had to click on a pop-up window to give their consent to be recorded. They were warned that any participant could record and share the lesson. Students were told that they could also switch off their cameras if they did not want to be seen. Finally, the interactions had a semi-public character as they took place during the lesson. This allowed the researcher not to ask for informed consent.

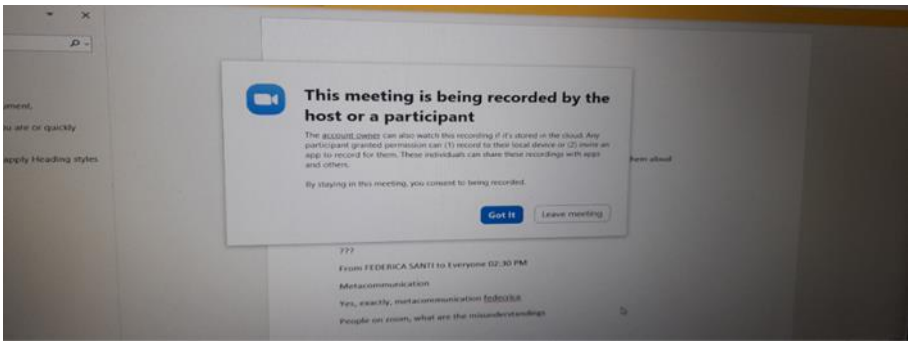

Figure 4. Consent pop-up window

To minimise the risk to informants, researchers have several options. In this illustrative study, identifiable information was deleted when the data were stored and processed (franzke et al., 2020). In line with this policy, no student data were stored, all names were replaced with the term "student" and a sequential number when field notes were annotated. As for the participating teachers, their names have been replaced by a code in the field notes and the keys to their identity are separate from the actual records. The questionnaires are anonymous and do not contain questions about personal details. In line with studies on video-mediated communication (Rosenbaum et al., 2016), all images of the participants were censored in talking-head format.

Conclusions

Working on current and complex topics can help researchers deliver relevant research findings and improve their job opportunities. However, complex, multifaceted and evolving phenomena may be challenging for

researchers as they require customised methods of data collection and analysis to provide comprehensive results. Therefore, researchers may find themselves at a crossroads. On the one hand, they may feel pressure to follow mainstream approaches and established research methods, such as qualitative or quantitative approaches. On the other hand, they may recognise that complex and evolving phenomena require new approaches that combine different methods of data collection and analysis but cannot rely on previous examples or consolidated models. The Covid-19 pandemic is an example of an unprecedented, multifaceted and evolving research topic that has triggered considerable research efforts. This article has reported on the difficulties and opportunities that one researcher experienced in planning a study, collecting and analysing data on the impact of videoconferencing on EFL classroom interaction during three academic years affected by the pandemic. The challenge was to investigate a mainstream and multilayered phenomenon from an original perspective to collect reliable and valid data and provide comprehensive and meaningful insights.

The first problem the researcher had to face was the identification of a research problem and the appropriate theoretical background. As this was an unprecedented phenomenon, it was not possible to rely on previous research. Based on personal expertise and research interest, the topic of video-based interaction in EFL university classes was chosen. The literature review covered different areas (Emergency Remote Teaching, computer and video-mediated interaction) and different approaches (surveys, micro-analytical approaches based on conversation and multimodal analysis). The process to identify comprehensive and manageable data consisted of different steps and started with a main research question (MRQ), which was successively divided into three sub-questions (CRQs) that allowed the researcher to identify the main areas of interest. Finally, each CRQ was subdivided into three operational research questions (ORQs), smaller and more manageable questions that helped the researcher pinpoint the procedure of data collection and analysis. To answer these questions, the researcher decided to collect quantitative and qualitative data over three years to gain a more comprehensive understanding of the impact of the pandemic on the topic of interest. Therefore, the researcher adopted a mixed methods approach to observe over time how the pandemic evolved and impacted interaction. The research design consisted of three rounds of data collection involving direct observations of online classes and online surveys focusing on teachers' and students' perceptions. This procedure differentiated the study from other research on interactions in online courses that focused on either the teachers or the students over a limited period.

However, it raised several methodological concerns, from the recruitment of participants to the validity and reliability of the data, which

have been presented and discussed in this article. For example, to provide a varied and representative sample participants from different universities were randomly chosen. Over the three years of data collection, the researcher had to replace the participants who withdrew with other informants with similar characteristics to keep the sample stable and consistent. At the same time, the researcher was aware that despite all the efforts the sample could be biased as the results referred to the participants who did not withdraw. These aspects had to be clearly stated and considered in the data presentation and discussion, as they could be a potential limitation of the study.

Regarding the data collection, the researcher was aware of the inevitable subjectivity involved in direct observations. To collect valid and reliable data, the researcher established and consistently followed a procedure of taking field notes and photographs to gather information about the context and then anonymizing the data to protect the identity of the participants. Dealing with online environments requires researchers to rethink their methods of data collection from an ethical point of view. Online settings are semi-public contexts where obtaining informed consent is not practical as the number of attendees may considerably vary and they can maintain a certain degree of anonymity by keeping their camera off or providing nicknames. As suggested by the guidelines of the Association of Internet Researchers (franzke et al., 2020), the researcher ensured that online participants agreed to participate in a lesson observed for scientific purposes, even if this might hinder spontaneous behaviour. Moreover, to limit the effects of the observer's paradox, different methods of data analysis and triangulation were employed. Finally, feedback on the methodology was continuously sought in discussions with other researchers.

In conclusion, this article drew on a research experience to show the opportunities and difficulties of a longitudinal mixed methods approach. It involved a complex research design, time-consuming procedures of data collection and analysis, and raised methodological concerns. However, this article argues that longitudinal mixed methods studies are effective in investigating multifaceted and evolving topics and help researchers provide original and relevant work, which is crucial to progress in their careers. Further studies applying this approach are needed to provide researchers with guidance on how to customise their research design to address complex and evolving topics and address methodological issues.

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