Disrupted Education: Examining the Experiences of Teachers Transitioning from Face-to-Face to Emergency Remote Teaching during COVID-19 Lockdown

Formazione interrotta: Indagare le esperienze dei docenti nella transizione dalla didattica frontale alla didattica remota d'emergenza durante il lockdown per COVID-19

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DOUBLE BLIND PEER REVIEW

ABSTRACT

The COVID-19 lockdown transformed education, forcing teachers accustomed to face-to-face lessons and laboratory use to quickly switch to emergency remote teaching. This study explores how pre-pandemic experience in online learning influenced this transition. Teachers with blended learning experience found it easier to adapt to fully online teaching, despite students' initial enthusiasm for blended learning waning over time. It emerged that students faced a greater workload with online assignments in all subjects. Teachers had to modify their teaching plans, especially for activities requiring laboratories, postponing them until schools reopened. Teachers' feedback highlights the importance of further professional development in online methodologies and investment in digital tools to compensate for the absence of laboratories.

Il lockdown per COVID-19 ha trasformato l'educazione, costringendo gli insegnanti, abituati a lezioni frontali e all'uso di laboratori, a passare rapidamente all'insegnamento remoto d'emergenza. Lo studio esplora come l'esperienza pre-pandemica nell'apprendimento online abbia influenzato questa transizione. Gli insegnanti con esperienza in metodologie blended hanno trovato più agevole adattarsi all'insegnamento completamente online, nonostante l'entusiasmo iniziale degli studenti per il blended learning sia calato nel tempo. È emerso che gli studenti hanno affrontato un carico di lavoro maggiore con l'assegnazione di compiti online in tutte le discipline. Gli insegnanti hanno dovuto modificare i piani didattici, soprattutto per le attività che richiedevano laboratori, rimandandole alla riapertura delle scuole. Il feedback degli insegnanti evidenzia l'importanza di ulteriori sviluppi professionali nell'uso di metodologie online e l'investimento in strumenti digitali per compensare la mancanza di laboratori.

KEYWORDS
Online Teaching, Emergency Remote Teaching, Challenges in Laboratory-Based Education during Lockdown
Insegnamento online, Insegnamento remoto di emergenza, Sfide nell'educazione laboratoriale durante il lockdown

Citation: Busuttil, L., Calleja, C. & Tonna M.A. (2023). Disrupted Education: Examining the Experiences of Teachers Transitioning from Face-to-Face to Emergency Remote Teaching during COVID-19 Lockdown. *Formazione & insegnamento*, *21*(3), 25-31. https://doi.org/10.7346/-fei-XXI-03-23_04

Conflicts of interest: The Author(s) declare(s) no conflicts of interest.

DOI: https://doi.org/10.7346/-fei-XXI-03-23_04

Submitted: November 12, 2023 • **Accepted**: December 6, 2023 • **Published**: December 29, 2023

Pensa MultiMedia: ISSN 2279-7505 (online)

Authorship: Conceptualization (L. Busuttil; C. Calleja; M. A. Tonna); Data analysis (L. Busuttil; C. Calleja; M. A. Tonna); Methodology (L. Busuttil; C. Calleja; M. A. Tonna); Writing – original draft (L. Busuttil; C. Calleja; M. A. Tonna); Writing – review & editing (L. Busuttil; C. Calleja; M. A. Tonna)

1. Introduction

The education of nearly 1.6 billion learners in more than 190 countries in all continents was heavily disrupted by the COVID-19 pandemic. Such a disruption was unprecedented. Ninety-four percent of the world's student population was impacted by the closure of schools and other learning spaces (United Nations, 2020). In a bid to slow down the progress of the virus, schools were closed and teaching shifted online. Physical schools were closed but teaching remained active. Some teachers found themselves in an entirely new territory whilst others who had previously used online learning albeit in a blended approach faced the challenge of interacting with their students in a totally online environment. The closure of schools also removed access to laboratories and tangible resources which the teachers were accustomed to using prior to the pandemic. This paper gives a voice to such teachers and reflects on how the investment in technology might need to change in order to mitigate similar situations in the future.

2. Background

The investment in educational technology has been increasing year on year throughout the European Union. The second survey of schools: ICT in Education published by the European Commission (European Commission, 2019) draws a picture of the state of use of technology in education throughout the European states as well as Norway, Iceland and Turkey. Most of this investment involved the improvement of internet connectivity in schools. This improved connectivity helped European programmes such as the eTwinning programme which encouraged collaboration between schools at times located in different counties participating in the programme.

There was also a substantial investment in hardware ranging from tangible user interfaces and interactive toys used in the early year phases of schooling (Janka, 2008;

Newhouse et al., 2017), to devices to be used by children such as tablets in the latter years of the primary phase (Major et al., 2017). Robotic kits and toys which can be coded also found their ways into most European schools pushed by the stance to improve coding skills of students to foster higher-order thinking and problem solving (Popat & Starkey, 2019). In line with Constructivist and Constructionist epistemologies (Ackermann et al., 1996; Resnick & Robinson, 2017), these devices are mostly being used in child-centred activities, with the children taking leading roles in coding the devices and tinkering with the code.

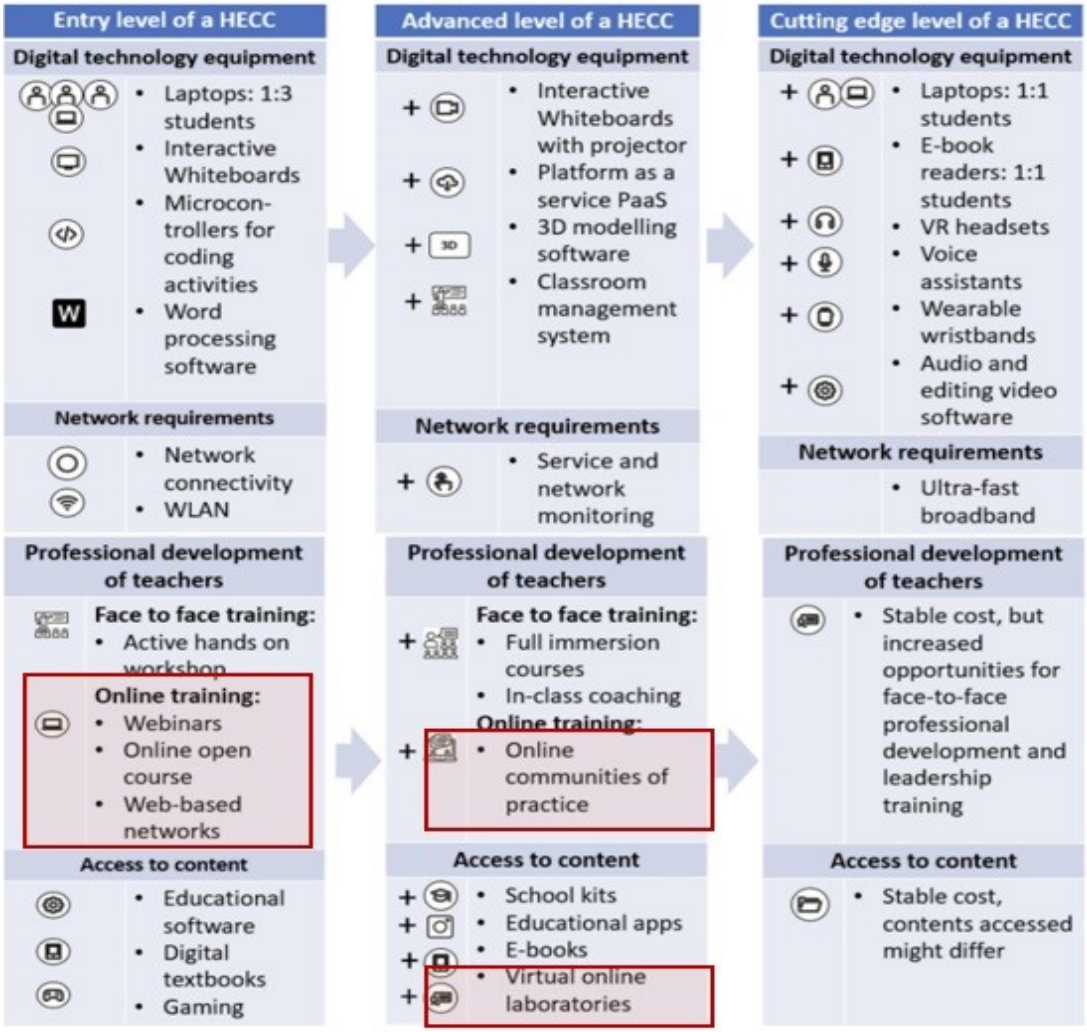

Figure 1. Models for Highly Equipped and Connected Classrooms (European Commission, 2019)

A study by the European Commission (European Commission, 2019) identifies a conceptual model for a 'highly equipped and connected classroom' (HECC) and lists three levels of this classroom: the entry level, the advanced level and the cutting edge level (see Figure 1). These levels are seen as a continuum with a school equipping classes in the entry level and then adding equipment to progress to the advanced and finally the cutting-edge level.

In all three HECC levels, online teaching and learning is mostly reserved for teachers' professional development (PD). In the entry-level scenario, teachers are seen as participants of online courses for PD purposes whilst in the advanced scenarios teachers are seen as members of a community of practice. The advanced level HECC also makes reference to the investment in Virtual online laboratories. Virtual laboratories provide the opportunities to students to simulate a real laboratory and conducting experiments (Ashton, 2014; Maulidah & Prima, 2018; Woodfield et al., 2005). Virtual laboratories provide several advantages over a traditional laboratory housed on physical premises. A virtual lab minimises safety concerns and allows students with little or no experience to attempt experiments, even if the students lack self-confidence. Virtual labs are also helpful in scenarios where a lack of equipment can be an issue, and they also allow additional learning time since no time is lost for cleaning up. (Tatli & Ayas, 2013).

3. The effects of Covid-19 on schools and learning

Although research on fully online teaching and learning pre-pandemic is abundant, this research tends to focus on courses held at university levels where the audience is an adult audience. Research on online teaching and learning in the K-12 scenario pre-pandemic tends to be based on blended forms of online learning with the exception of some research on virtual schools (Barbour & Reeves, 2009; Dipietro, 2010), which are becoming popular in some parts of the world especially in the USA.

The closure of schools brought about by the Covid-19 pandemic shocked the system since teachers had to quickly adapt to changing all their teaching to an online modality (Busuttil & Farrugia, 2020). The goalposts had to be shifted as teachers moved out of their comfort zones to adapt to a new reality. Resources idealised in the connected school were left closed within the physical school. Teachers found themselves searching and adapting novel ways to communicate with their students confined inside their homes. The approach adopted was not a planned transition towards online teaching and learning but was at best described as Emergency Remote Teaching (Bozkurt & Sharma, 2020) or Emergency Forced Remote Education (Afip et al., 2020)

As research shows shifting to an online modality came with its own set of challenges in the technological, pedagogical and social domains (Busuttil & Farrugia, 2020; Ferri et al., 2020; Fujita, 2020; Zhu et al., 2020). Connectivity to the internet from the educators and students homes wasn't always reliable, and students also faced access issues to electronic devices. Pedagogically, the teachers' and students' lack of digital skills; the lack of structured content versus the abundance of online resources; learners' lack of interactivity and motivation and teachers' lack of social and cognitive presence also posed significant challenges. The social challenges were related to the lack of human interaction between teachers and students, the lack of physical spaces at home for lessons to take place, and the lack of support from parents who frequently work remotely in the same spaces. The social challenges disproportionately impacted the most vulnerable students, whilst the significant disruption in the students' schooling resulted in a consequential learning loss (Spiteri et al., 2022). Teaching online also resulted in an increase and change in workload for teachers (Kaden, 2020).

4. Methodology

The purpose of this paper is to respond to calls by scholars (Crompton et al., 2021) to understand how technology was used during the pandemic in K-12 situations and to identify gaps in existing research. As argued earlier the investment in technology in schools prior to the pandemic was based on school connectivity to the internet and tools to be used by students. In this study we focus on the experiences of teachers who were accustomed to conducting classes in a face to face modality and to using laboratories and equipment in schools prior to the pandemic and who subsequently had to rush into emergency forced remote teaching. Their experiences are important to help shape the debate on the type of technological resources needed in schools post pandemic. We also explore the experiences of teachers who had used online learning in a blended approach prior to the pandemic to identify how this helped teachers once they embarked on emergency remote teaching. The following research questions will be addressed:

- RQ1: In what ways did the use of blended learning before the COVID-19 pandemic help teachers and students when shifting to a fully online mode?
- RQ2: How did the change to a fully online mode affect teachers of subjects that required access to specialised equipment usually found in laboratories/workshops to conduct lessons?

In order to generate data for this study a series of online focus groups were held with educators teaching classes in primary and secondary schools, members of the school management teams as well as parents. This paper focuses on the data generated by the focus groups attended by teachers teaching in secondary schools (students aged 11 to 16). A focus group is defined by Krueger (Krueger, 1988) as a carefully planned discussion designed to obtain perceptions on a designated area of interest in a permissive, non-threatening environment. It is a particular type of group interview where a moderator structures the discussion but where importance is given to group interaction (King et al., 2019). Recruitment was done through calls for participation posted on teachers' groups in Facebook. The online focus groups allowed us to collect rich, detailed data through a semi-structured approach. Since these focus groups were done

when the schools were closed, the video communication platform Zoom was used to conduct these focus groups in an online environment.

Ethical approval was sought and gained from participants. As Wiles (Wiles, 2013) emphasises in most qualitative research, confidentiality through the process of anonymity cannot be assured. This is especially the case when a study involves individuals with distinct roles and a small number of organisations. For this reason, the participants were informed that their responses would be anonymised however anonymity cannot be fully guaranteed.

A necessary precursor to the analysis of data is transcription. King et.al. (2019) stress the importance of adopting a consistent style during transcription so that anyone reading the material can understand the features of speech the notation used indicates. They also warn about three threats to quality transcription which the research should mitigate against, namely quality of the recording, missing context and "tidying up". The researchers used the Zoom platform to conduct and record the interview. The quality of the discussion undertaken via Zoom depends on the quality of the internet connection at the interviewer and interviewee. In this research, the internet connection quality did not pose a problem. Non-verbal communication and paralinguistic aspects are just as important as the answers provided the questions posed during the interview. Zoom recorded the video and audio of the discussions. This allowed the researchers to consider non-verbal communication and paralinguistic aspects whilst transcribing the focus group sessions. Every focus group was transcribed soon after it was conducted. Whilst transcribing, every care was taken to produce an accurate account of what the discussion that ensued rather than a grammatically correct version of the discussion.

Thematic analysis (Braun & Clarke, 2006; Nowell et al., 2017) was used to analyse the data generated through the focus groups. Braun et.al. (2006) identify six phases in a thematic analysis approach to analysing data. Although the phases are usually presented as a sequential list, and each phase builds on the preceding one, Braun et.al. (2006) note that analysis is typically recursive. The researchers found themselves navigating back and forth between different phases. The researcher read the transcripts several times to become immersed in the content. The Coding phase, or identifying important data features that might be relevant to answering the research questions, was conducted soon after. Codes were grouped to identify potential themes or broader patterns of meaning. As Saldana (2009) stresses, qualitative enquiry demands meticulous attention to language and deep reflection on emergent patterns and meanings of human experience. This attention to detail resulted in the coding process being iterated several times, with each coding cycle resulting in more refined codes and resulting themes. The potential themes identified were reviewed to determine that they answered the research questions. Finally, the themes were named, and the analytic narrative and data extracts were weaved together. Taguette (Rampin & Rampin, 2021), an open-source tool for qualitative research was used to aid the coding process.

5. Findings

The teachers participating in this study taught various subjects in class, ranging from languages to sciences and vocational subjects. Some of the teachers had used the online modality in a blended format before being forced into emergency remote teaching whilst for others the shift to an online medium was a totally new experience. In the following section, the themes that emerged from the analysis are presented.

5.1 Anxiety and Uncertainty

The shift to emergency remote teaching created a level of anxiety and uncertainty among teachers. Teaching online requires a different pedagogical approach then teaching face to face and the teachers were expected to perform this transition in a very short time. However what caused the anxiety in teachers was not just the change in modality but also the lack of foresight into when the situation will return back to normality. This focus group excerpt from one of the teachers narrates the frustration of having to plan day to day:

> *It was very frustrating at the beginning, because it was not clear how long it was going to take if it was going to be one week, two weeks, one month. So I was not really sure about how to plan. And for how long to plan. For me, it was the most difficult issue* [a teacher of Spanish].

This uncertainty accompanied teachers not only when schools were closed and teaching and learning shifted to online, but also when schools reopened but the pandemic was still active. Planning to teach a subject online is different from planning to teach a subject face to face in class and teachers were finding it difficult on whether to plan for the online modality or to plan to teach face to face:

> *The uncertainty as my colleague was mentioning, and I think that is the one thing that I am literally at this point not knowing what's going to happen. I mean, usually during the summer holidays, and even throughout the year, I update my resources constantly. At this point, I have no idea what's going to happen.*

5.2 Disparity between subjects

Whilst discussing with the teachers during the focus group session, it became apparent that the online modality used during the school closures worked best for subjects that did not use laboratories or specialised school-based equipment.

> *I teach English and French and to be honest, digital works very well for me. So if we're speaking about reading, listening, speaking and writing, it works extremely well for me* [a teacher of English and French].

Other teachers who use laboratories in their day-to-day school experience did not share this view. As

the excerpt below shows, some teachers faced significant issues with conducting lessons online, usually held in laboratories. One of the teachers mentioned the frustration experienced with not having access to the equipment for the students to carry out experiments. The teachers had to choose which experiments could be conducted safely in the home environment and skipped the rest of the experiments.

> *I was irritated, mostly because we used to do practical sessions. In science, especially in Biology O level, you need to do practical work. Unfortunately, that had to stop. The kids cannot do it at home as they had no apparatus. They had nothing. ....um, for example, at one point, I was thinking to see how I could manage certain practice session that they can do at home, which did not require certain equipment. And so certain experiments, for example, like measuring heart rate, I mean can be done at home* [a teacher of Biology].

Another issue brought up by the teachers participating in this research is the use of video demonstrations instead of hands-on activities by the students. As the teacher in the excerpt below argues, the video demonstrations are not "good enough" since they transform the user into a passive recipient of knowledge rather than an active participant.

> *I was finishing off the syllabus with the form fives, so it was only theory topics which I was doing. But I can't imagine how I can do practical work. In the form five syllabus in our case, we go through repairing a computer. This includes diagnosing faults. It is not possible. Students need to have these tools. So maybe, maybe I can do some demonstration. And maybe I use document cameras. I could show them what I'm doing on the computer. That's it though. Is a demonstration sufficient? I cannot assess them. They don't have the tools at home. So practically I think it's impossible online, unless there is some method, which I don't know of. I think they have to be face to face* [a teacher of VET IT].

5.3 Prior online teaching experience

The prior use of the online modality was quite valuable for some teachers who participated in this study. Since the students were accustomed to a blended approach before the pandemic, the students were accustomed to using elements of online learning such as quizzes and practising the flipped classroom approach (Keengwe, 2014) whereby the students do research and prepare work which is then discussed in class.

> *When school suddenly closed, I had already been accustomed to Google Classroom, my students had already been using it throughout the years across platforms. So I'd already use an element of blended learning. They knew what quizzes were using Google Classroom. We had students I had students before, who would, for example, watch videos at home, do some research at home and related to a particular topic we're exploring* [a teacher of English and French].

However, as the excerpt below explains, this excitement quickly expired once all subjects were forced into emergency remote teaching. The methods the students considered novel when using blended learning became tedious once most subjects used them. The students were inundated with more work than they were accustomed to when schools were physically open, and lessons conducted face to face.

> *As soon as you went totally online then one of the biggest realities was that a lot of my students had a high influx of work happening I think even more work than when we were at school. When I was using Google Classroom throughout the scholastic year, the students used to enjoy it, because it was different to other teachers ... , when everyone was doing it, then I think they [the students] became immune. And eventually, they did get bored of it. ... So I tried to adapt using Google Classroom as a platform to communicate with my students. ... I had done web quests as well throughout the year. Again, they became immune to that* [a teacher of English and French].

6. Discussion and Recommendations

This research sought to give a voice to teachers who were accustomed to using school-based resources before the pandemic and were forced to move to emergency remote teaching when the schools closed and learning shifted online. The teachers reported feeling anxious and uncertain about their curriculum planning. This tallies with the findings of other research (Wakui et al., 2021), which describes how the mental well-being of teachers was negatively affected during the pandemic.

These teachers' voices suggest that subjects that relied on physical artefacts, such as laboratories, which were locked in schools during the pandemic, found the shift to online learning harder than other subjects that could use the online modality much more effectively. Although video demonstrations could be used to mitigate the loss of equipment, these demonstrations were not deemed equivalent to the experience made possible by the use of the physical artefacts. The experiences recounted by the teachers of Biology and

VET IT mimic that of the chemistry teachers in the research by Babin áková and Bernard (2020), who stated that chemistry/science schoolteachers were in a particularly tough situation during the emergency forced remote education because they had to organise the teaching of not only theoretical knowledge but also practical aspects, and therefore, they needed to transfer experiments and laboratory activities to an online environment.

The teachers who participated in this research expressed their frustration in not providing a similar experience as possible in a face-to-face class to their online students. The experience of these teachers tal-

lies with other research, which states that when experiments are taught by watching videos online, the students lose the environment and teachers needed for the experiments. Online videos also do not allow students to gain a deeper understanding of the significance of the experiment through multi-sensory participation (Lv & Peng, 2021).

The teachers were also concerned that they could not assess their students' learning as they would in class when the students were using physical devices. It was interesting to note the lack of exposure of these teachers to the possibilities offered by available technology, such as virtual labs , online simulators and augmented reality (Altmeyer et al., 2020). Even though virtual labs were included in the specifications for the highly equipped and connected classrooms (European Commission, 2019), it seems that not much attention was given to the possibilities offered by this technology in teacher professional development courses. Research suggests that virtual laboratories may have a prominent role in inquiry-based and self-guided education with minimum instructor dependency, which may be crucial for complementing practice skills (Radhamani et al., 2021).

Students accustomed to blended learning before the pandemic found it more straightforward when the change to emergency remote teaching was introduced. This finding is in line with similar findings in research (Reimers, 2022), which state that countries that made greater investments in Digi-pedagogies before the pandemic found it easier to transition to remote instruction when compared to countries who did not make such investments and consequently found it more challenging to adopt remote instructional strategies. However, in this research, the teachers observed that the novelty of online modality quickly expired when all teachers started to assign tasks to the students, with the students becoming overwhelmed with the work assigned.

To foster the adaptability and effectiveness of educators in the ever-evolving educational landscape, this paper presents a series of recommendations.

Tailored professional development initiatives should be deployed to acquaint teachers with virtual labs, online simulators, and augmented reality tools. Identifying and highlighting exemplary practices and success stories can inform the creation of workshops that underscore the seamless integration of these tools into online teaching practices. These professional development initiatives should also tackle assessment challenges in online learning environments by offering guidance and training on alternative assessment methods suitable for the online context. The emphasis of these programs should be on strategies for sustaining student engagement and preventing task overload, ensuring continued efficacy in online teaching.

Concerted efforts should be made to integrate virtual labs into teacher training courses and certification programs, ensuring educators are well-versed in leveraging the potential of these technologies. Modules should specifically address adapting practical experiments and laboratory activities for the online setting.

Endorsing subject-specific support groups or communities for teachers in disciplines like biology, chemistry, and VET IT can facilitate the sharing of insights, resources, and effective strategies for online teaching. Such support groups would cultivate a collaborative culture among teachers, establishing platforms for resource sharing, including virtual lab experiments, and successful strategies for engaging students in remote learning.

7. Conclusion

The feedback provided by the teachers and the experiences they narrated are essential to help shape the debate on the type of technological resources needed in schools post-pandemic. Their feedback highlights the importance of further professional continuous development (CPD) in using online methodologies with children. This is especially important when coordinating the tasks assigned by multiple teachers teaching different subjects concurrently. The teachers' voices also highlight the importance of investment in online tools to mitigate the absence of laboratories and workshops when schools are closed.

Such tools could potentially make use of enabling technologies such as augmented reality in order to give the students the experience of using the tools found in laboratories without having physical access to the tools themselves.

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