Teaching and Learning in the Covid-19 Era: The Experience of an Italian Primary School Class

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Abstract
The authors present a case study, where digital technologies were implemented for online education (particularly, mathematics education) at Italian primary school level. Results of this study confirm that the quick transition to the online form of education, due to the COVID-19 pandemic, was successful and provided experience which may be useful in future didactic activities.
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Introduction

The coronavirus19 pandemic has influenced educational systems worldwide, leading to the widespread closure of schools, universities, and colleges. In response to this closure, UNESCO endorsed the use of distance learning programs, open educational applications, and platforms that schools and teachers could use to reach learners remotely, limiting the interruption of education.

During the COVID-19 pandemic, social media such as *WhatsApp*, *Google meet*, *Google drive*, *Zoom app*, *Microsoft Teams* have become the primary sources of education across the world. In this crisis, technologies have been mastered and used responsibly by educational institutions. Many academic administrators have made online content available for free to assist teachers and students worldwide with distance learning. During the period of lockdown, schools, colleges and Universities have moved online: Learning institutes and teachers have been promoting e-learning among their students, ensuring that all of them can benefit. There are some possible situations of inequality owing to difficulty in connectivity and accessing technology, but, for the present, staying at home has been considered to be the safest solution for everyone.

Theoretical Background

Beyond this period of crisis, the profound changes taking place in society worldwide increasingly have highlighted the centrality of individual learning and the development of targeted skills.

The attention of the institutions and teaching training experts is nowadays placed, in particular, on informal and nonformal learning spaces (Sutherland & Sutherland, 2010), on the workplace as a strategic skills development venue (Schön, 1993; Weick, 1995), capable of enhancing the skills acquired (Perulli, 2006). In Europe, Lifelong Learning programs have been designed to support the creation of a European learning area (Aleandri, 2011).
As in all sectors, innovation will be essential to bring about qualitative changes in education.

In recent years, governments have invested heavily in information and communications technology (ICT) in schools. The quality of school educational resources, including ICT and connectivity, has significantly increased in recent years. Although education is not a "change-averse" area, with improvements already taking place in classrooms, it has not managed to harness technology to raise productivity, improve efficiency, increase quality, and foster equity (OECD, 2016). International surveys have found that digital technologies have not yet been fully integrated into teaching and learning (OECD, 2016). Analysis of the Programme for International Student Assessment (PISA) data on the effects of ICT on students' outcomes adds to the sobering picture. The introduction of digital technologies in schools has not yet delivered the promised improvements of better results at a lower cost. In this perspective, non-formal learning contexts appear to be connected to the spread of new technologies. The fact that information and communication technologies (ICT) first entered families and then schools (Quaglino, 2005, 2014) confirms the importance of informal learning in community life. The non-formal (and informal) environment represents a considerable reserve of knowledge (Schein, 2017) and an essential source of innovation

in teaching and learning methods. For example, the spread of e-learning training, in all its forms (we refer to the different distance learning devices, blended learning, massive learning etc.), shows the advantage of developing a "community of practices" as initially intended (Lave, 1991). A community of practices is a space for reflection and action capable of conveying formal and non-formal learning within educational communities and training organizations (Wenger, 1998). Collecting the experiences of people in a learning situation and understanding the contexts within which to develop the didactictraining design is thus central to the design of scenarios favourable to the teaching-learning processes.

Many studies have already examined the effectiveness of e-learning, investigating the relationship between instructional materials and their structure, the teaching strategies, the abilities and behaviour of students (in terms of their selfdiscipline when using the Internet as the primary teaching tool) (e.g., Alenezi, 2020; Duffy & Jonassen, 2013). Past research has shown that perceived resources play an essential role in the success of information system adoption (Noesgaard & Ørngreen, 2015). Technology users are strongly motivated when they perceive the presence of necessary resources. It is reasonable to assume that this perception also leads to the adoption of better online learning. The construct of perceived resources was included in this research to examine the influence of an individual's belief in having the necessary resources for using an online learning system.

In this period of crisis, Zimmerman (2020) recently compared online and traditional learning in an article entitled *Coronavirus and the Great Online-Learning Experiment*, arguing that teachers often fail to make the connection between what we do in a physical classroom and what we do online. Education is mainly a relationship. In this crisis situation, we are aware that we have not only to keep the didactic and formal learning aspects alive, but also to exercise our educational role, maintaining a high level of motivation and student involvement.

In Italy, the Ministry of Education issued a statement, clearly stating that distance teaching, in these difficult weeks, had and has two meanings. It urges the entire educating community to exercise its professional and ethical responsibility to continue to pursue the social and educational task of schooling, but not at school, and maintaining, in fact, the community. Keeping the school community alive obviates the risk of isolation and demotivation; the interaction between teachers and students can be the glue that maintains and strengthens relationships, sharing the challenge facing us (MIUR, Ministerial note 388 of 17 March 2020).

So how can we systematize informal learning moments and support the development of life skills in students, such as communication and interpersonal skills, critical thinking and self-management skills?

Life skills are abilities for adaptive and positive behaviour, which enable individuals to deal effectively with the demands and challenges of everyday life (WHO, 2020). Described in this way, skills that can be said to be life skills are innumerable, and the nature and definition of life skills are likely to differ across cultures and settings. However, analysis of the life skills field suggests that there is a core set of skills that are at the heart of skills-based initiatives for the promotion of the health and well-being of children and adolescents. These skills are: Decision-making, Problemsolving, Creative thinking, Critical thinking, Effective communication, Interpersonal relationship skills, Self-awareness, Empathy, Coping with emotions, and Coping with stress (WHO, 1997).

In a typical classroom, anything can happen: Some students laugh, another teacher or a collaborator drops in, the computer does not work, someone asks to go to the bathroom. All this may hinder our lesson plans, but adds variety to our lessons; that is, it allows us to adjust the learning rhythm and to lower, if necessary, the cognitive rate required by the activities. While it is not possible to virtually reconstruct the classroom context and replicate its management methods, it is feasible, indeed indispensable, to implement some group management strategies remotely, in order to carry out our educational function even at a distance. This is the real question: Is it merely about transferring our management strategies into a new context or rather acquiring new ones?

To make this possible, teachers should work on two aspects to an even greater extent than previously: attention to students and focusing on explicit and implicit purposes. First, be aware of the attention to the online signals coming from the students and of our reactions to them and, second, concentrate on what we propose, on how we propose it, and on what thoughts pass through our mind during "classless" teaching. There is one thing that does not change, in the real and the virtual, and that is the attention to our levels of awareness, which we find in the thoughts that arise spontaneously, in the will to explain again a concept that seemed acquired or to endure yet another interruption due to technical problems or the attitudes of some students.

What does not change, in physical or online classes, is the ability to manage ourselves, in order to be able to fully manage, in our unchanged educational task, the new relationships via technology that continue and will continue to involve real people, with their emotions, their moods, their dreams, and their needs. Some authors (Basilaia &

Kvavadze, 2020) suggested stepping back and taking a deep breath, thinking deeply about the educational goals before proceeding with the plan of an online learning experience. Focus on developing an online learning experience rather than just online content delivery. Generally, a person does not become an excellent online instructor without having first been an online student. So, it could help to take the opportunity to learn more about best practices around the net. Also, it is essential to learn about ways to communicate the teacher's personality and to teach style in the online context and, last but not least, take a positive approach and seek to use this as an opportunity to do some educational research about your online teaching style.

There is, therefore, a need to remodel the distance that separates us from the students to offer closeness even if we are far away, and to live, in an uncertain present, the possibility of a future that we do not know and that perhaps will improve the society of tomorrow.

The Didactic Experience

The Research Group

The experience illustrated here arose in the context of our research group ("Nucleo di Ricerca in Didattica della matematica", Department of Mathematics and Geosciences, University of Trieste), made up of a diverse group of teachers from nursery school, primary school, middle school and high school (teaching children and teenagers ranging from 3 to 19 years old) and led by university lecturers involved in multiple activities aimed at promoting and improving the teaching of mathematics at varying school levels.

In the periodic group meetings, difficulties, gaps and misconceptions are highlighted and we endeavour to find together "prevention" and "solution" strategies to them. Our activity is also "outward-looking" and "open to others" with the organization of events to promote mathematics among children and teenagers, and to offer initial or in-service training for teachers; among these, should be remembered, in particular, the "La matematica dei ragazzi" event, which has been held every two years since 1996 and in 2018 reached its 12th edition (see Leder, Scheriani & Zuccheri, 2002; Zuccheri & Zudini, 2014). In 2020, owing to the spread of the COVID-19 virus, the event was postponed (the date is still to be decided) for reasons of safety.

The Case Study

The experience illustrated here deals with teaching at primary school level (in Italy, primary school level lasts 5 years: from first to fifth year, with children aged 6-11 years) by one of the authors of the paper, Daniela Leder. She became a permanent member of staff in 2000 and in recent years has been the "main teacher", teaching Italian, mathematics, science, art and English. In the school year covered by our study (2019/2020), she taught the 5E class ("Scuola Foschiatti", "I.C. Valmaura", Trieste), made up of 17 students: 6 girls and 11 boys.

A Week at School Prior To Covid-19

Daniela Leder's timetable as 5E's teacher prior to COVID-19 (September 2019-February 2020) was the following (see Figure 1):

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
8.10-9.10	Daniela Italian	Daniela Mathematics	Daniela Italian	Patrizia R.E. / Daniela	Daniela Mathematics
9.10 – 10.00	Daniela Italian	Daniela ("dual presence")	Daniela Italian	Daniela Science	Daniela Mathematics
10.00 – 10.20	*Break*		*Break*	*Break*	*Break*
10.20 – 11.10	Daniela English		Daniela Mathematics		Patrizia R.E. / Daniela
11.10 – 12.10	Daniela Mathematics			Daniela Italian	Daniela English
12.10 – 13.10	Daniela Science		Daniela English	Daniela Mathematics	Daniela Italian
13.10 – 14.10			*Lunch*		
14.10 – 15.10			Daniela Art		

Figure 1. Daniela Leder's timetable in class 5E prior to COVID-19 ("Patrizia" is the name of the colleague who taught R.E./ Religious Education. Daniela was responsible for the students who did not take part in the R.E. lessons. On Tuesdays, instead, there was "dual presence" where Daniela acted as support for another teacher in the same class)

The Weeks at School in the Covid-19 Era

From the moment that, owing to the spread of COVID-19, schools were closed (from March 2020, in Italy and specifically in the Region of Friuli Venezia Giulia, where Trieste is located), the teacher adopted online teaching/ distance learning. The technical and legal aspects were discussed with colleagues and the head teacher. When analysing the activity *a posteriori*, four phases emerge in the activity of online teaching regarding the interaction developed by the teacher with her students:

Phase 1: 2nd - 6th March 2020

Some very simple revision exercises were sent via email to a mother (the class representative) who in turn forwarded them to the other parents.

Phase 2: 9th - 16th March 2020

An email address was created *ad hoc* for the students. The *Edmodo* platform was activated and, on 12th March, the first message was sent. The activities were sent subject by subject. The materials were collected and stored, via email, on *Drive*, where there was a file for every child, which was shared with the parent, or on *Edmodo*. The first trial run was carried out this week via *Skype* and then via *Zoom.*

Phase 3: 16th March -5th April 2020

The activities were presented according to the school timetable, day by day. The weekly plan was sent on Fridays so that working parents would have time to download all the material and give it to the pupils (many of the pupils' parents work). Three times a week (Monday, Wednesday and Friday), there was a 40-minute class video call on *Zoom* in the afternoon (in the morning, many pupils were unable to connect because the device was shared with brothers/sisters or with their own parents, who were all at home, each busy with lessons or remote working).

Phase 4: 6th April 2020 - the end of the school year (June 2020)

Group work began with a daily appointment: the first group in the morning, the second in the afternoon and then everyone together on Friday afternoon (sub-division into two groups was a decision necessitated by competing commitments in the family, with parents, brothers and sisters all involved in remote-working/distance learning). Thus, the class passed from no meetings to one and then two/three meetings a day, at first for 40 minutes and then for about an hour/an hour and a half, (which, in reality, was generally slightly more). If, at the beginning, the aim of the meeting was to build up the group feeling, as time went on, the didactic element regarding each subject was added.

Therefore, school "attendance" became the following (see Figure 2):

	ITALIAN	MATHEMATICS	ENGLISH	ART
MONDAY	9.30-10.00 and 15.30-16.00	10.00-10.30 and 16.00-16.30		
TUESDAY	9.30-10.00 and 15.30-16.00	10.00-10.30 and 16.00-16.30	10.30-11.15 and 16.30-17.15	
WEDNESDAY	9.30-10.00 and 15.30-16.00	10.00-10.30 and 16.00-16.30		10.30-11.00 and 16.30-17.00
THURSDAY	9.30-10.00 and 15.30-16.00	10.00-10.30 and 16.00-16.30		
FRIDAY	9.30-10.00 and 15.30-16.00 all together 16.30-17.00	10.00-10.30 and 16.0016.30		

Figure 2. Daniela Leder's timetable in class 5E in the Covid-19 Era

Generally, regarding primary schools (but the same applies to the later levels), a right balance should be found, according to age, between remote teaching activities and breaktimes so as to avoid the risks arising from an excessive amount of screen time.

Some Examples: Contents and Methods for Mathematics Education

In order to give an example, we consider below two typical remote teaching weeks for mathematics (the first from Monday 27th to Thursday 30th April 2020 - Italy celebrates 1st May as a national holiday; the second from Monday 4th to Friday 8th May 2020). We focus particular attention on the themes taught and the methodology employed to deal with them.

For both weeks, the work for science and English was sent by email. In "class", Italian, mathematics, art and English were covered (see the timetable in Figure 2). Every day, after having asked every child how he/she was, lessons began by checking homework and went on, working together.

Monday 27th to Thursday 30th April 2020
Monday
Mathematics
Oral test on polygons (after having done the quiz on *Edmodo*). While the teacher questioned one student, the other children were able to begin doing their homework: from the geometry workbook, on perimeter and area.

Tuesday
Mathematics
Revising the meaning of mean, median and mode with exercises.

Wednesday
Mathematics
Reasoned constructions of polyhedrons with toothpicks or marshmallows.
The children began to understand the minimum number of toothpicks needed to construct a polyhedron (4). They observed that cylinders and other solids with curved surfaces cannot be constructed. The terms "prism" and "pyramid" were introduced.

The class was reminded that they had made Sierpinski trees for Christmas, using cardboard tetrahedrons. The teacher showed them one and the differences were noted: With toothpicks, the edges and vertices are highlighted, but the solid is "perforated", and you cannot see the area or the development.

Thursday
Mathematics
Construction of rotating solids starting from plane figures (for the cylinder, many rectangles folded in half and stuck together were used). Registration in the exercise book of work done.

Monday 4th to Friday 8th May 2020
Monday
Mathematics
The class read together in the textbook the meaning of "developing the solid" (hinted at in the previous lesson). The teacher took a toothpaste packet and opened it. Together, the class drew the development in the exercise book and made observations.

Tuesday
Mathematics
The volume of a parallelepiped was dealt with. A discussion was held as to what could be used to fill the toothpaste carton from the previous lesson. The children said in order: a liquid, a powder (flour, salt, sand), coarse salt, rice, maize, beans, grapes. Grapes were suggested as something pearl-shaped which, however, being spherical, were no good. Thus, casting around for something with more edges, they came upon the cube. Every suggestion was accepted and the class talked together as to how well the space could be filled or not.
Some pupils asked whether this applied also to the cylinder or sphere. The teacher suggested (maybe) talking about this later on.
Homework was given, consisting in cutting out a 20-centimetre-sided square and two circles with different radii.

Wednesday
Mathematics
Exercises on the area and volume of the parallelepiped and of the cube. In order to understand better, the solids were constructed out of paper.

Thursday
Mathematics
Exercises on the area and volume of the parallelepiped and the cube.

Friday
Mathematics
More exercises on the area and volume of the parallelepiped and the cube.

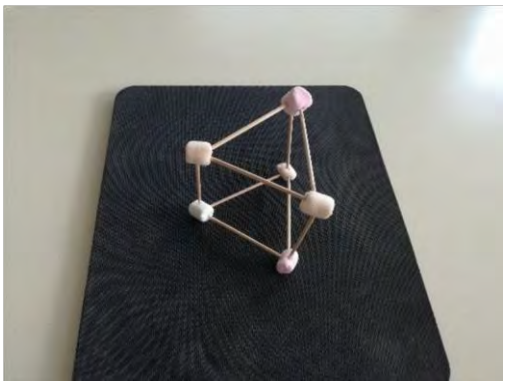

Figure 3. Polyhedron constructed by the children (Photo by Daniela Leder)

Some Remarks

The experience of the COVD-19 pandemic has caused everyone (*in primis,* those directly involved - teachers, students and their parents) to reflect a little on the role of technology in teaching and on teaching in general. After a first phase of the emergency, various aspects emerged.

With regard to teaching in general, the lack of an essential element - the relational aspect - was immediately felt, in particular, physical contact: For primary school children, an affectionate gesture, such as a pat on the head, or practical help in an activity, is worth much more than remote voice support.

"Time" became a problem: With remote learning, lessons must be brief (and this also happened in class), but, above all, there may not be enough time to carry out and finish a piece of work. The teacher and the pupils can start together, but then the children must finish the work by themselves at home in order to show it to the teacher the day after, if it is an object, or send a photo if, it is written work… And the parents, who, in the meantime, are working, cannot always be diligent in sending the material: Some are only able to do so once a week (thus, twenty files arrive all together), others have to be chased up… only two pupils, from the middle of May onwards, became independent in doing this.

When the children were asked their opinion about the experience, the majority said that they had missed being in class together… A few pointed out that there had also been positive aspects: There had been less homework and it had been possible to get up later in the morning… As time passed, however, the children tired of the situation: Even if there had been less homework, there had been no trips or handicrafts or other activities that they had done and enjoyed before. When asked which week had been the most noteworthy or interesting for them, some pupils were at a loss as to what to say. When pressed, the majority underlined missing their classmates (they saw each other all together only on Fridays), as if they had not felt complete. However, some children remembered the days when the concept of volume was defined (collective discussion) and the first week of video meetings (they still remembered the excitement).

Observations by the teacher were also noteworthy regarding the experience of remote teaching lived during the pandemic of COVID-19. The necessity of mastering the digital tools had been a positive element for her: She discovered and used resources which before she had only seen fleetingly. The NEGATIVE part (written in capital letters) however lies in the fact that remote teaching lacks the relational aspect, nearness, which only being physically present can achieve: Interacting for real is very different from only partially seeing each other (often only the children's faces can be seen…) via video. Given her normal teaching methods, where skills are acquired, remembering that "you learn through discussing" (cooperative learning: See, e.g., Pontecorvo, Ajello & Zucchermaglio, 2007) - if possible in groups - and where the workshop approach is favoured wherever possible, remote teaching is not sufficient and is limiting, only to be adopted where absolutely necessary.

It is true that the teacher learnt to use interesting tools, tools which she will use again perhaps in the future (her exact words). The teacher deliberately used the word "perhaps" because, in the act of teaching, you are not alone and, particularly when dealing with primary school children, family involvement is taken for granted.

In order for it to happen, remote teaching requires that everyone involved (teacher and children) have access to the necessary devices and are able to use them appropriately. For various families, this often meant that parents and children had to share the devices, as they were all engaged in remote activity (some for work and some for study). This obviously had repercussions on class teaching, in terms of timetabling and the way these tools were used. Furthermore, so as to avoid risks attached to excessive use, the children could not indulge in too much screen time (the device was sometimes a smartphone). It should also be noted that, for primary school children, parents' intervention is often needed when logging on to the device, often being called to assist their children in the correct and safe management of technology.

Think, for example, about sending homework: During the emergency period, the students' homework was collected in three different ways (*Edmodo, Drive* and email), not so much because the teacher wanted it thus, but because it might simplify the "work" of the parents. Some parents were even too involved and present, while others were practically absent; among the parents, there were those who would have wished for more remote teaching hours, while others would have wished for fewer. It is true that not all parents had the time to learn how to use the new tools and, in any case, at the beginning of the experience, the teacher herself had to help them by offering, as far as she could, "technical assistance". It was only from the middle of May onwards, as already said, that some children began to send homework by themselves: good for them! However, there were only a few of them… in reality, only four… However, it should be noted that, by the end of the school year, all the children had developed various technological abilities (for example, using at the same time various windows or different devices).

A few comments can also be made on how the teacher's day changed, in that, with the aim of meeting the needs of her students to the best of her skills and abilities, she ended up in front of the computer from 8 a.m. until late afternoon (at the beginning, only with the tablet), using her own internet at her expense. Her typical day, therefore, was closely linked to the computer: at the beginning of the working day, sifting through the material received (checking her emails and files on *Drive* and on *Edmodo*); then, checking over the day's lesson, perhaps to add something; then, logging on to do the video lesson of the morning. The lunch break was about one hour. While waiting for the afternoon's lesson, and after, there were preparation of materials, marking homework, training via webinars and studying new tools for presenting themes and collecting homework and/or meetings with children's parents and with colleagues.

Beyond the activities mentioned, which are rightly part of distance learning, there were school meetings (teachers' council, interclass) and those linked to the duties, which the teacher had during the school year in her educational institution (e.g., group coordinator for preparing tests).

In practice, she was often to be found still in front of the computer at 18-19.00… and at 20.00 she forced herself to turn it off. The sensation was that of never really signing off and of having messages continually arrive which required answering (every file sent, in fact, was analysed) and she looked forward to the weekend to have, at least in part, a break (the files could arrive even on Saturday and Sunday). In any case, how could she not reply to work sent by a pupil?

The experience of class 5E and their teacher is certainly one in a thousand, even million, in the world… and every class has its own story…., but the observations that have been made are very interesting seen from the point of view of how we all may use remote teaching profitably, even in different contexts (not necessarily in an emergency).

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