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**Distance learning and teaching as a consequence of the Covid-19 pandemic:
A survey of teachers and students of an Italian high school taking into
account technological issues, attitudes and beliefs toward distance learning,
metacognitive skills**

(submitted: X/02/2021)

Abstract

The Covid-19 pandemic has forced the education system to a rapid and unprepared transition to distance learning, leading many teachers to organize lessons with the support of information and communication technologies (ICTs), but without a sufficient technological and organizational support. Our study aims to evaluate the experience of ICTs following the first lockdown due to the COVID-19 pandemic, considering factors relevant to ICTs effective use, that we group into three categories: technical issues, attitudes and beliefs toward online learning, and metacognitive skills. Participants were 486 students and 83 teachers of a Northern Italy high school, who were administered a self-reported online questionnaire measuring. Video-lessons and audio-lessons emerged as overlooked teaching modalities. The desktop was the less used device, teachers prefer the tablet, and students the smartphone. In general, students displayed appreciation of distance learning, even if they would appreciate more interactive activities. Teachers' level of metacognitive competence and self-efficacy were rather high. For students, perception of the e-learning environment was a positive predictor of perceptions on distance and anxiety about e-learning, with anxiety also being higher among females. For teachers, evaluation of distance learning was positively predicted by teachers' beliefs about ICTs, demonstrating the importance of promoting positive ICTs beliefs to motivate teachers to engage in distance learning. Higher perceived self-efficacy was associated with lower levels of anxiety, showing the need to engage in supporting and formation activities enabling teachers to feel confident when using ICTs.

KEYWORDS: Distance Learning, e-learning, smart teaching, ICT, COVID-19

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CITE AS

1. Introduction

The global emergency of Covid-19 represents an unprecedented shift in education. More than 1.725 billion children worldwide were affected by school closures in response to the pandemic (Holme, 2020). UNESCO (2020) recommended the use of distance learning programs and open educational applications and platforms that schools and teachers can use to reach learners remotely, limiting the disruption of education. This unplanned move to online learning led to a reaction by teachers to quickly replace standard learning methods by using the new technologies. The hasty transition, a general lack of preparedness, and bandwidth led to an unfulfilling virtual learning experience for both teachers and students, fostering the general perception of virtual learning as being of lesser quality compared to face-to-face education (Sindiani et al., 2020).

Some countries have witnessed a lively debate between Information and Communication Technologies (ICTs) supporters and those who think that ICTs are ineffective or even harmful for school learning (Schleicher & Reimers, 2020).

When the relationship between ICTs and students' learning outcomes was directly explored, the results were mixed: some indicated increased learning using new technologies (Chen, Chiang, & Lin, 2013), others did not provide evidence of significant differences between traditional and smart learning (Higgins, Beauchamp, & Miller, 2007).

In this study, we aim to provide a general assessment of the experience of ICTs following the first lockdown due to the COVID-19 pandemic, considering a broad range of factors that may be relevant to ICTs use. Since teachers and students can be characterized by similar, but also by different or complementary perceptions, and may place greater importance on some factors over others, departing from most research, we decided to investigate ICTs perceptions from both points of views. Specifically, we conducted a study aimed at investigating perceptions of ICTs use among teachers and students of a high school in Northern Italy which, like many other, had to resort to ICTs to face the lockdown caused by the pandemic. Why studies generally focused on a specific or a few specific aspects, we took into account several aspects, broadly included in three main categories: technological issues, attitudes and beliefs toward ICTs use, metacognitive skills.

ICTs in learning/teaching environments

Many factors can influence online learning: materials, activities, motivation, students' learning styles, and self-regulation (Ligorio et al., 2010). Digital devices can be effective in delivering content and fostering pupils' motivation (Amiri & Sharifi, 2014), promoting social interaction, peer teaching, and collaboration (Somyürek, Atasoy, & Özdemir, 2009), favoring a constructive didactic approach (Jonassen, Howland, Marra, & Crismond, 2008), ultimately leading to meta-cognitive

learning and to learn how to learn, rather than learn a particular skill (Monteith, 2002).

Digital devices should not be understood as 'teaching machines', but as a 'tool' that allows students to co-construct their own learning path, to socialize it and therefore to personalize it with respect to personal cognitive styles (Battro, 2010). Introducing ICTs in school and using them as traditional tools is not sufficient. ICTs should match the characteristics of the individual and favor an active and efficient learning process. In this sense, the challenge does not concern the introduction of ICTs per se, which is quite straightforward. Instead, it relates to the ability to use them to stimulate students and their learning process as efficiently as possible, taking advantage of their potential and allowing them to overcome their learning weaknesses.

These considerations lead us to recognize the importance of teachers in the efficient use of ICTs (Drossel et al., 2017). Assuming that student achievement will automatically increase with technology use may be wrong and even dangerous since it can lead to overly optimistic and unrealistic expectations. With the Covid-19 pandemic, Italian teachers had to resort to smart teaching as a replacement of traditional teaching. The general idea emerging from the public discourse, however, is not that of an effort to take advantage of their potential, but to use them as a temporary replacement before returning to traditional teaching.

Several aspects need consideration to plan effective and motivating ICTs learning environments. Most studies focused on one of these issues, from the perspective of either teachers or students. In order to provide a more systematic account of these factors and their role in online learning, we grouped them into three categories.

Factors impacting online learning

Technical issues

ICTs effectiveness can be influenced by many factors, including technology availability, accessibility of ICT equipment, and technical and administrative support (Fu, 2013). According to Venkatesh and Davis (2000), when teachers are presented with new technology, two factors influence their decision to use them: external variables and perceived usefulness. Amongst the external variables, they report limited ICTs facilities, accessibility and network connection, lack of effective training, and technical competency. Toprakci (2006) found that low numbers of computers (in relation to the number of students), obsolescence or slowness of ICT systems, and scarcity of educational software in the school constitute barriers to the successful implementation of ICTs in schools. However, according to Becta (2004), the inaccessibility of ICTs resources is not necessarily due to the unavailability of hardware, software, or other materials within the school. It may be the result of various factors, such as poor resource

organization, poor quality hardware, inappropriate software, or lack of personal access for teachers.

ICTs competency, internet connectivity, technical issues and usability can hinder students' usage of ICTs (Silin & Kwok, 2017). Volery and Lord (2000) proposed a framework to identify the critical factors for the success of online education, focusing on three aspects: technology (ease of access and navigation, interface design and level of interaction), instructor (attitudes toward students, instructor technical competence and classroom interaction), and previous knowledge and use of the technology.

Attitudes and beliefs toward online learning

Positive attitudes of both teachers and students towards ICTs can facilitate the process of integrating technological innovation into teaching and study (Sang et al., 2010). Several studies have shown that teachers' and students' perceptions of whether the use of ICTs in class improves learning outcomes and motivation predict the use of ICTs in school (e.g., Davis et al., 2013; Eickelmann & Vennemann, 2017; Teo et al., 2009), and that negative attitudes toward ICTs lead to being less informed about ICTs use that, in turn, results in a less frequent use of digital devices (Drossel et al., 2017).

Teachers' self-reported competencies regarding pedagogical and technical knowledge have been shown to predict ICTs use (Fraillon et al. 2014). Other factors underlie the personal characteristics of the teachers, in particular their willingness to change, the beliefs about their adequacy in the use of ICTs (Roca & Gagne, 2008), as well as their expectations about learning and interest shown by students (Perkmen, 2014). Balanskat et al. (2006) have shown that low teacher's perceived competence is a strong barrier to the integration of technology into education and one of the factors involved in resistance to change. Edmunds, Thorpe, and Conole (2012) report that perceived usefulness and perceived ease of use of ICTs are key dimensions to encourage teachers' acceptance and use of ICTs in learning processes. Factors that have been identified as key elements to teachers' perceived usefulness of ICTs are the possibility to work more quickly, increased job performance, increased productivity, and teaching effectiveness (Venkatesh & Davis, 2000). Watson (1993) identified a wide range of skills and competences that teachers need to find in an easy-to-use technology tool, which should be easy to learn, clear and understandable, controllable, easy to remember.

Research has shown that also students' attitudes and their readiness to accept computer technology in teaching are critical to the success of their learning (Teo et al., 2009). Sun and Zhang (2008) showed that some students' anxiety about the use of ICTs affects their satisfaction in e-learning courses. Kubiato (2010) found that effective use of ICTs in students could have the benefit of improving attitudes and computers skills, which, in turn, could improve the effectiveness of ICTs, thus creating a positive feedback spiral.

Metacognitive skills

There is consistent evidence that effective ICTs use requires changes in attitudes, values, and beliefs that develop confidence for ongoing learning and adaptability to change (Phelps, Graham & Kerr, 2004). Such approaches require teachers to challenge their pedagogical beliefs and practices and to be more self-directed in identifying what they need to learn, what kind of teachers they are to promote life-long learning. A range of elements impact on teachers' ICTs learning, such as self-efficacy, anxiety, support, encouragement, perceived usefulness, pedagogical orientation, goal orientation, volition, problem-solving, playfulness, help-seeking, learned helplessness and attribution (Phelps & Graham, 2008).

According to Phan and Dang (2017), training, attitude, technical competence, time constraints, pedagogy and methodology are among the main predictors of efficient distance learning education. Providing pedagogical training for teachers, rather than simply training them to use ICTs tools, is of primary importance (Becta, 2004). Some studies showed that after a professional course in ICTs, teachers still did not know how to effectively integrate ICTs in their classrooms, because the courses only focused on basic ICT skills and did not teach teachers how to develop the pedagogical aspects of ICTs and how to use them in their classrooms in preparing lessons (Balanskat et al., 2006; Cox, 2003). The metacognitive competence allows people to think about themselves as computer learners, taking control over their learning and teaching processes and developing confidence and willingness to try new ICTs integration in school.

Finally, we acknowledge the role of background variables, such as age and gender. In general, studies show that older teachers have a lower tendency to use ICTs in class (Fraillon et al. 2014), whereas gender is related to the frequency of computer use in class: male teachers seem to use computers more frequently than their female colleagues (Eickelmann et al. 2017). Other studies however did not detect gender differences in the teachers' use of ICTs in class (Shapka & Ferrari, 2003).

There are mixed results of gender differences in attitude toward ICTs students' use. While some studies found that male students have a more positive perception of smart technologies than female students (e.g., Liaw, 2002), other studies did not highlight significant differences (e.g., Adenuga et al., 2011).

We believe it is necessary to deeply reflect on the use of digital technologies in school contexts, to make distance teaching a positive experience for both students and teachers. It appears crucial to investigate the availability, attitudes, and difficulties experienced by both students and teachers, to design distance learning interventions that are effective and do not respond only to the current crisis.

We conducted a research on a sample of students and teachers from an Italian high-school taking into account the three main categories of factors affecting ICTs use

and effectiveness, that is technological issues, attitudes and beliefs toward ICTs, metacognitive skills. Specifically, we collected data on teaching and learning modality, tools used (devices, platforms), and problems that emerged during the lockdown caused by the pandemic. We also investigated psychological variables such as perceptions, attitudes, beliefs, metacognition, anxiety, and self-efficacy, which can contribute to bringing people closer or further to the use of new technologies, facilitating a smooth transition to distance learning. The ultimate goal was to understand which variables predict a positive evaluation of distance learning in both students and teachers.

2. Materials and Methods

2.1 Participants and Procedure

Participants were 486 students (11.9% males, mean age = 16.3 years) and 83 teachers (24.1% males, mean age = 53.47 years) of a high school located in Reggio Emilia (Northern Italy). Participants were administered a self-reported online questionnaire.

2.2 Procedure and materials

Teaching modality. Participants were administered a list of teaching modalities among which to choose the one(s) used during the lockdown (the list was similar for students and teachers): streaming or video-lessons; audio-lessons; videos, documentaries, and other online resources; lecture notes or other school material; tasks to deliver to the teacher; online questionnaires and tests; individual study; project activity.

Device. We asked participants to report the device used for online learning, by using the following options (participants could report more than one device): desktop, laptop, tablet, smartphone.

Problems emerged. Participants were asked to indicate the extent to which they experienced difficulties in online learning (reported in Table 1). All answers were provided on 5-points scales, anchored to 1 (*not at all*) and 5 (*very much*).

Anxiety. Participants were administered the STAI S-Anxiety Scale (Spielberger et al., 1983), a 20 items self-report questionnaire to measure the presence and severity of the symptoms of anxiety. We asked teachers and students to think about how they feel when they are or were about to start a distance learning activity and indicate how true each statement was for them using a 4-points scale ranging from 1 (*not at all*) to 4 (*very much*) (alpha .94).

Students' perceptions of distance education (students). Participants were administered 6 items (Educational Factors) of the Distance Education Questionnaire (DEQ) (Gok, 2015) to investigate the college students' opinions about distance education courses. All answers were provided on 5-points scales, from 1 (*not at all*) to 5 (*very much*) (alpha = .79).

Students' perceptions of the e-learning environment (students). The students were asked to respond to a questionnaire made of 24 items loading on 11 scales, measuring various aspects of their perception of the e-learning environment (Martens et al., 2007); the different subscales are shown in Table 2. All answers were provided on 5-points scales, anchored to 1 (*not at all*) and 5 (*very much*) (alpha = .89).

Measure	Students		Teachers	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Problems with online connection	3.21	1.16	2.81	0.98
Unavailability of device	1.66	1.15	1.25	0.60
Difficulties in using apps or programs	2.48	1.27	2.31	0.97
Scarce collaboration with peers (for students) or communication problems with students (for teachers)	2.51	1.38	2.64	1.00
Emotional or personal problems	2.73	1.50	2.46	1.15
Difficulties in organizing learning	2.62	1.25	/	/
Difficulties in time planning	2.72	1.24	/	/
Difficulties in translating traditional lessons in online lessons	/	/	2.72	1.16
Low preparation in how to organize a non-traditional lesson	/	/	2.49	1.15
Insufficient knowledge on how to motivate/teach in distance learning	/	/	2.69	1.02
Insufficient preparation on how to evaluate students in distance learning	/	/	3.28	1.17
Necessity of reducing the contents presented	/	/	3.18	1.12
Discomfort in being repeatedly online	/	/	3.47	1.31

Table 1 - Means and standard deviations for students ($N = 486$) and teachers ($N = 83$) in relations to problems emerged.

Note. The response scale for all measures ranged from 1 to 5.

Measures	Students	
	<i>M</i>	<i>SD</i>
Perceived authenticity of the e-learning environment	2.76	0.89
Extent of confusion regarding the e-learning environment	2.84	0.93
Experienced support in the e-learning environment	3.16	0.82
Extent of explorative behavior of the learner	2.58	1.10
Extent of collaboration with other learners	2.34	0.96
Positive opinion about the use of role-play	2.22	1.19
Opinion about the usefulness of discussion with other learners	2.67	1.06
The e-learning environment urges exploration	2.40	1.14
The e-learning is innovative	4.14	0.86
Intrinsic motivation	2.65	1.14
Total score	2.81	0.65

Table 2 - Mean scores and standard deviations (subcomponents and total score) for students' perceptions of the e-learning environment ($N = 486$).
Note. The response scale for all measures ranged from 1 to 5.

Teachers' metacognitive experience (teachers). We used the Teacher Metacognition Inventory (Yingjie, Lin, & Liang, 2016), consisting of 21 items that investigate different aspects of metacognition in teachers (reported in Table 4). All answers were provided on 5-points scales, anchored to 1 (*not at all*) and 5 (*very much*) ($\alpha = .84$).

Teachers' beliefs about ICT (teachers). We administered the Teachers' beliefs about ICTs, a Likert-type scale containing items that presented statements of beliefs toward ICT and its application in education (Jimoyiannis & Komis, 2007). The questionnaire consists of three subscales (shown in Table 5): All answers were provided on 5-points scales, anchored to 1 (*not at all*) and 5 (*very much*) ($\alpha = .65$).

Teachers' self-efficacy (teachers). Teachers were asked to answer to a 12 items questionnaire aimed to measure three domains of self-efficacy, reported in Table 6 (Klassen & Ming, 2010). All answers were provided on 5-points scales, anchored to 1 (*not at all*) and 5 (*very much*) ($\alpha = .84$).

Evaluation of distance learning (teachers). Teachers were administered a 12 items *ad hoc* questionnaire, created to measure the positive attitude towards distance teaching. All answers were provided on 5-points scales, from 1 (*not at all*) to 5 (*very much*) ($\alpha = .91$).

3. Results

With respect to teaching modality, 73.5% and 97.9% of teachers declared the use of streaming video-lessons. The use of registered video-lessons and audio-lessons was reported by 38.1% of students, and by 15.7% (registered video-lessons) and 18.1% (audio-lessons) of teachers (for teachers, two items were used to tap response to the two modalities). Most students (55.6%) and teachers (68.7%) reported having used videos, documentaries, and other online resources. Similarly, the use of lecture notes or other school material was reported by 74.7% of students and 78.3% of teachers. Another popular modality concerned the tasks administered to students and to hand back to the teacher (91.8% students, 90.4% teachers). Interestingly, students and teachers reported on the use of online questionnaires and tests, reported by 89.3% of students and 44.4% of teachers. Finally, 68.7% of students reported resorting to individual study, and 13.3% of teachers reported having worked on project activities.

The desktop was indicated as the less used device by 12.8% of students and 30.1% of teachers. In contrast, students (65.4%) and teachers (78.3%) used to a greater extent their notebook. Tablets were used more by teachers (44.6%) than students (24.1%); the opposite tendency emerged for the smartphone, used more by students (63.2%) than teachers (34.9%).

As can be noted in Table 1, participants experienced various types of difficulties. However, the average levels of difficulties expressed were relatively low.

Descriptives for the measure of students' perceptions of the e-learning environment is presented in Table 2. As can be seen in Table 2, values for the different components of students' perceptions of the e-learning environment, and the global score, were moderate, with low values for the components "extent of collaboration with other learners," "positive opinion about the use of role-play", the "e-learning environment urges exploration." In contrast, relatively high values have been obtained for the dimension "The e-learning is innovative."

The evaluation of distance education, as resulting from the average score obtained for the measure of students' perceptions on distance education, was moderately negative ($M = 2.69$, $SD = 0.79$), as also indicated by the reliable difference from the mid-point (3), $t(485) = 8.57$, $p < .001$. In contrast, anxiety was moderately high ($M = 2.84$, $SD = 0.88$), with the average score higher than the mid-point (2.5), $t(485) = 8.52$, $p < .001$.

To understand the incremental contribution of demographic factors and students' perceptions of the e-learning environment on the evaluation of distance education and anxiety experienced, we ran a linear regression analysis. Results are reported in Table 3.

	Students' perceptions of distance education	Anxiety
Age	-.05*	-.02
Gender (1 = males, 2 = females)	-.03	.10*
Students' perceptions of the e-learning environment	.81***	-.51***
<i>F</i>	317.72***	57.89***
<i>R</i> ²	.66	.27

Table 3 - Linear regression testing predictors of students' perceptions of distance education and anxiety (*N* = 486).
 Note. **p* < .05. ***p* < .01. ****p* < .001.

As can be noted in Table 3, students' perceptions of the e-learning environment were positively associated with both outcome variables over and above the effects of demographics. These associations were fairly strong, with students' perceptions of the e-learning environment associated positively with students' perceptions of distance education and negatively with anxiety.

Measures	Teachers	
	<i>M</i>	<i>SD</i>
Metacognitive experiences	3.89	0.83
Metacognitive knowledge about pedagogy	4.14	0.86
Teacher metacognitive reflection	3.66	0.80
Metacognitive knowledge about self	3.01	0.90
Teacher metacognitive planning	4.07	0.80
Teacher metacognitive monitoring	3.92	0.66
Total score	3.76	0.54

Table 4 - Mean scores and standard deviations (subcomponents and total score) for teachers' metacognitive experience (*N* = 83).
 Note. The response scale for all measures ranged from 1 to 5.

We present in Table 4 descriptives for teachers' metacognitive experiences. As can be seen, average scores are rather high (except for metacognitive knowledge about the self, which is moderate), as is the global score.

We present in Table 5 descriptives for teachers' beliefs about ICT. For both subcomponents and global scores, scores were moderate, although teachers revealed higher scores in the component "Teachers' beliefs about ICT integration in education."

Measures	Teachers	
	<i>M</i>	<i>SD</i>
Teachers' beliefs about ICT as a teaching and learning tool	3.07	0.70
Teachers' beliefs about ICT integration in education	3.54	0.46
Teachers' beliefs about ICT in the educational process	3.03	0.77
Total score	3.24	0.36

Table 5 - Mean scores and standard deviations (subcomponents and total score) for teachers' beliefs about ICT (*N* = 83).
 Note. The response scale for all measures ranged from 1 to 5.

Descriptives for teachers' self-efficacy are presented in Table 6. Scores were generally rather high, indicating moderate-to-high levels of self-efficacy in teachers.

Measures	Teachers	
	<i>M</i>	<i>SD</i>
Job satisfaction	3.09	1.00
Classroom management	3.89	0.71
Student engagement	3.67	0.77
Instructional strategies	3.44	0.88
Total score	3.54	0.68

Table 6 - Mean scores and standard deviations (subcomponents and total score) for teachers' self-efficacy (*N* = 83).
 Note. The response scale for all measures ranged from 1 to 5.

Evaluation of distance learning in teachers was rather negative (*M* = 2.84, *SD* = 0.88), with the average score lower than the mid-point (3), *t*(82) = 8.91, *p* < .001. Teachers also revealed average levels of anxiety (*M* = 2.49, *SD* = 0.53); the average score did not differ from the mid-point (2.5), *t* < 1.

To evaluate the relative contribution of the measured factors and demographics in determining teachers' evaluation of distance learning and their anxiety, we ran linear regressions. Results are presented in Table 7.

As can be seen in Table 7, teachers' beliefs about ICT emerged as the only significant predictor of a more positive evaluation of distance learning. In contrast, the only predictor of anxiety was teachers' self-efficacy, with greater perceptions of self-efficacy associated with lower levels of anxiety.

	Students' perceptions of distance education	Anxiety
Age	-.17	-.07
Gender (1 = males, 2 = females)	-.08	.17
Teachers' metacognitive experiences	-.08	.05
Teachers' beliefs about ICT	.48***	-.11
Teachers' self-efficacy	.17	-.36**
<i>F</i>	8.83***	4.39***
<i>R</i> ²	.36	.22

Table 7 - Linear regression testing predictors of teachers' evaluation of distance learning and anxiety ($N = 83$).

Note. * $p < .05$. ** $p < .01$. *** $p < .001$.

4. Discussion and Conclusions

The first part of our study descriptively investigated how online learning has been implemented during the lockdown. It is worth noting that registered video-lessons and audio-lessons, that is the two modalities that require more planning and self-commitment by teachers, emerged as overlooked teaching modalities. The desktop is the less used device, while both students and teachers resort to the laptop. Interestingly, while teachers prefer the tablet over the smartphone, the opposite tendency emerges among the students. Part of these differences may be due to the different use that teachers and students make of these devices (with teachers using them proactively to provide lessons, and students likely using them more passively). However, one may speculate a change in cultural use of these devices. Portability and usability will certainly be more and more features that will influence the choice of the use of devices. It is not surprising that the desktop computer is the least used by both teachers and students. Teachers prefer tablets probably because they have larger screens and keyboards, students prefer smartphones because they are familiar with this tool, almost representing an extension of the self.

With respect to students' perceptions of distance education and anxiety level experienced, we found that females felt higher anxiety during the smart learning experience, and that students displayed a greater appreciation of distance learning. In general, while students believe it to be an innovative practice, they recognize that the extent of collaboration with other learners is critical and that the e-learning environment

promotes little exploration. These results suggest that students would like to participate in more active and interactive activities (research, projects, group activities) proposed in smart environments, rather than following traditional lessons conveyed by digital tools.

Findings revealed that students' perceptions of the e-learning environment are critical in determining how students evaluate distance education. The explained variance was very high (81%). In addition, in this situation largely determined by the ongoing pandemic, the anxiety experienced is also a function of students' perceptions of the e-learning environment. In other words, appraisal of the e-learning environment contributes to well-being related to distance education, in addition to shaping how this is evaluated.

The teachers' level of metacognitive competence was generally rather high. This result suggests that the teachers have gained good pedagogical knowledge, but they have not achieved sufficient awareness of themselves. This result seems to be confirmed by the reported levels of self-efficacy: they perceive to have a good level of competence and control in classroom management, student engagement and the use of instructional strategies, however, they do not seem very satisfied with their job. Job satisfaction is a condition that is achieved more easily with a good awareness of oneself, of one's needs, objectives and desires. Interestingly, for teachers, the evaluation of distance learning and anxiety were a function of different predictors. Evaluation of distance learning was positively predicted by teachers' beliefs about ICTs, demonstrating the importance of promoting positive ICTs beliefs to motivate teachers to engage in distance learning. In contrast, higher perceived self-efficacy was associated with lower levels of anxiety, showing the need to engage in supporting and formation activities enabling teachers to feel confident when using ICTs.

In Italy, during the pandemic, one of the main problems has been the absence of central coordination: in most cases, teachers had to decide at the individual level (not even at the school level, with a few relevant exceptions) whether and how to use smart teaching. Without training and collective guidance, the introduction of ICTs is going to fail and support the expectations of the many who believe traditional teaching is best. The situation caused by the pandemic can represent a stimulus to rethink teaching contexts by integrating new technologies in a more informed way to make students more motivated, metacognitive, autonomous, and capable of self-regulation, all skills that support lifelong learning and that will be crucial for the citizens of the future.

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