Project Number: 2021-1-ES01-K220-SCH-000034434

Practices

When schools were closed in most countries in March 2020 because of the COVID-19 pandemic, teachers had no other option but to change their classrooms into online learning spaces. It was a critical global incident. In research on identity and teacher training, a critical incident is unexpected situations that hinders the development of the planned activity and that, by exceeding a certain emotional threshold, puts the identity in crisis and obliges those teachers review their concepts, strategies, and feelings. Thus, these incidents can become meaningful resources for training and changing teaching and learning practices because they allow us to review our deep beliefs.

The critical global incident generated by the pandemic forced most teachers to assume virtual teaching where they had to use digital technologies, sometimes for the first time, to facilitate their students' learning. The closure of schools as a consequence of COVID-19 led to substantial changes in education with profound consequences. Today we know that educational inequalities have widened, while students have suffered greater social and emotional imbalances. In this context, families have also been more involved in the school education of their children. Moreover, it has been necessary to rethink the teaching strategies in the new virtual classrooms.

For several decades, many authors have argued that ICT as educational devices facilitate the adaptation of teaching to each student. Some argue this is because they can promote collaboration, interactivity, the use of multimedia codes, and greater control of learning by the learner In this way, their integration in the curriculum would contribute to the acquisition of 21st-century competencies (autonomy, collaboration, critical thinking, and problem-solving) that the OECD links to the so-called "global competence" that should define the current education.

However, after decades of use of ICT in classrooms, they have not fully achieved their promise to transform teaching and learning processes. The results of a lot of international studies are, in fact, quite discouraging, like those claimed by the PISA studies (OECD, 2015). In its report, the OECD(2015, p. 3) concludes that "the results also show no appreciable improvements in student achievement in reading, mathematics or science in the countries that had invested heavily in ICT for education." Thus, Biagi and Loi (2013) found that the more education ICT uses reported, the less learning in reading, mathematics, and science achieved. These data caused even Andreas Schleicher, head and coordinator of PISA studies, to claim that "the reality is that technology is doing more harm than good in our schools today" (Bagshaw, 2016).
These conclusions contrast with the results obtained in most of the experimental research on the effects of ICT on learning. A decade ago, after conducting a second-order meta-analysis of 25 meta-analyses, Tamim et al.(2011, p. 14) found "a significant positive small to

Funded by the European Union

moderate effect size favoring the utilization of technology in the experimental condition over more traditional instruction (i.e., technology-free) in the control group," a conclusion that is still valid today. Various studies and meta-analyses reflect moderate but positive effects on learning, whether for example from the use of touch screens in preschools (Xie et al., 2018), from cell phones (Alrasheedi et al., 2015; Sung et al., 2015) or video games (Clark et al., 2016; Mayer, 2019). It has also been found that they favor collaboration in secondary education (Corcelles Seuba and Castelló, 2015) or learning mathematics (Li and Ma, 2010; Genlott and Grönlund, 2016), science (Hennessy et al., 2007) or second languages (Farías et al., 2010).

What is the reason for this disagreement between research conducted in experimental laboratories and large-scale studies? Many factors could explain this distance (de Aldama, 2020). But one difference is that the experimental studies have been carefully designed and controlled to promote these forms of learning mentioned above, while the usual work in the classroom is mediated by the activity of teachers who, in most cases, have little training using ICT (Sigalés et al., 2008). Several authors (Gorder, 2008; Comi et al., 2017; Tondeur et al., 2017) conclude that it is not the ICT themselves that can transform the classroom and learning, but rather the use that teachers make of them. While the experimental studies mostly promote activities that encourage autonomous learning (Collins and Halverson, 2009), the most widespread uses of ICT, as reflected in these international studies with more diverse samples, report other kinds of use whose benefits are more doubtful.

Different classifications of teachers' use of ICT in the classroom have been proposed in recent years (e.g., Gorder, 2008; Mama and Hennessy, 2013; Comi et al., 2017). Tondeur et al. (2008a) differentiate three types of educational computer use: (a) basic computer skills; (b) use of computers as an information tool, and (c) use of them as a learning tool. Laying aside the acquisition of basic skills related to digital devices, learning is promoted by the last two uses that lead to second-order digital skills related to information management and its conversion into knowledge (Fulton, 1997; Gorder, 2008). Thus, the distinction is usually made between two types of use. The first use is aimed at traditional teaching, focused on the transmission and access to information, and usually called teacher-centered use (although perhaps it should be called content-centered use). The second one, called student-centered use, promotes diverse competencies (autonomy, collaboration, critical thinking, argumentation, and problem-solving) and is part of the Global Competence characteristic of 21st-century education (Ananiadou and Claro, 2009; OECD, 2019, 2020). According to Tondeur et al. (2017), integration of ICT in education requires assuming a constructivist conception of learning and adopting a student-centered approach in which the students manage the information through the ICT instead of, as in the more traditional approach (content-centered), it being the teacher who uses the ICT.

The experimental studies mentioned above show that student-centered approaches improve verbal earning, producing a better understanding of the subjects studied,

Funded by the European Union

The European Commission's support does not constitute an endorsement of these contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of this information.

promoting self-regulation of the learning processes themselves, and generating critical and collaborative attitudes toward knowledge. Thus, Comi et al.(2017, pp 36–37), after analyzing data from different standardized assessments, conclude: "computer-based teaching practices increase student performance if they are aimed at increasing students' awareness of ICT use and at improving their navigation critical skills, developing students' ability to distinguish between relevant and irrelevant material and to access, locate, extract, evaluate, and organize digital information." Besides, they also found a slight negative correlation between using ICT to convey information and academic performance.

In spite of these better results of adopting student-centered uses, the studies support that the most frequent uses in classrooms are still centered on the teachers, who indeed use ICT as a substitute for other more traditional resources to transmit information (Loveless and Dore, 2002; Sigalés et al., 2008; de Aldama and Pozo, 2016). Even if what Ertmer (1999) called type I barriers are overcome, related to the availability of these technological resources and the working conditions in the centers, several studies show that there are other types II barriers that limit the use of ICT (Ertmer et al., 2015); in particular, the conceptions about learning and teaching to the extent that they mediate the use of ICT (Hermans et al., 2008).

Different studies have shown that these teachers' beliefs about learning and teaching are the best predictor of the use made of ICT in the classroom (Ertmer, 2005; Ertmer et al., 2015). Most of the work on these beliefs (Hofer and Pintrich, 1997, 2002; Pozo et al., 2006; Fives and Gill, 2015) identifies two types of conceptions: some closer to a reproductive vision of learning, which would be related to the teacher or content-centered teaching uses, and others nearer to constructivist perspectives, which promote student-centered teaching uses. Studies show teachers who have constructivist beliefs tend to use more ICT than those with more traditional beliefs (Judson, 2006; Law and Chow, 2008; Ertmer et al., 2015). They also employ them in a more student-centered way, and their uses are oriented toward the development of problem-solving skills (Tondeur et al., 2017). On the other hand, teachers with more traditional beliefs use them primarily to present information (Ertmer et al., 2012).

However, the relationship between conceptions and educational practices is not so clear and linear (Liu, 2011; Fives and Buehl, 2012; Tsai and Chai, 2012; Mama and Hennessy, 2013; Ertmer et al., 2015; de Aldama and Pozo, 2016; de Aldama, 2020). Many studies show a mismatch between beliefs and practices, above all, when we refer to beliefs closer to constructivism that do not always correspond to constructive or student-centered practices.

Funded by the European Union

The European Commission's support does not constitute an endorsement of these contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of this information.