Mini Review

Initial teacher training and the incorporation of TIC. a study in a Chilean university

Patricio Ibáñez -León,[1] Sandra Perez-Lisbon,[2] Javier Vergara-Núñez[2]

[1]Departamento de Ciencias de la Educación, Facultad de Ciencias de la Educación, Universidad de Playa Ancha, Chile
[2]Facultad de Ciencias de la Educación, Departamento de pedagogía, Universidad de Playa Ancha, Chile

Correspondence: Patricio Ibáñez -León, Facultad de Ciencias de la Educación, Departamento de Ciencias de la Educación, Universidad de Playa Ancha, Chile, Tel +56996513105, Email Patricio.ibane@upla.cl

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Introduction

The effects of the pandemic in chile: learning outcomes and their relationship to teacher education

In Chile, as well as in the other countries of Latin America and the Caribbean, as a result of the pandemic derived from COVID 19, schools and high schools were closed for almost two years - 158 days on average in the region - according to UNICEF.[1] Our country, like most countries, was forced to hold virtual classes during the peak period of the pandemic (2020 and part of 2021), in order to continue with the teaching and learning processes. In this regard, Spain (2022) notes that "the average school closure time in Chile was 71 weeks, placing it as the 13th country in the world that kept its schools closed for the longest time and the first in the OECD" (p. 2). This same author considers this period as an earthquake in terms of the deterioration of learning, as well as the deepening of the gap between public and private schools; in short, despite the efforts deployed, the online teaching system or the implementation of virtual classes did not have the expected results, producing a huge stagnation in the learning of children and adolescents.

This implies that schools attended by children and adolescents from low socioeconomic levels were the most affected, with an estimated 68.4% drop in expected learning for the 2020-2021 period. Regarding this drop in learning, the Center of Studies of the Ministry of Education (2021), Salmi (2021) and Spain (2022), coincide in pointing out that the rural sectors and the most economically deprived populations did not have access to internet, a fundamental tool to be able to develop distance classes.

The scarce access and lack of computer tools could explain the delay in learning and why the rural sectors and the most economically vulnerable were most affected. A significant number of students simply could not connect or connected sporadically to classes. In many rural sectors, a system of learning guides was used, which teachers took to the students' homes, so that they could advance in some of the relevant content, which in no way replaced the situation of regular classes with teachers and students working together. Moreover, considering that in many of these homes the educational level of the parents is very low and, therefore, there was not enough support for the students to develop the guides and their contents. Regarding this effort, developed by rural teachers, the press of the period reported it as follows:

Such is the case of the now famous teacher from Santa Juan, Inés María González, who became known for delivering educational materials to her students on a cart, after traveling nearly 20 kilometers from Poduco Alto to Colico. "I do it because they have no Internet, no telephone and even less a computer".[2]

However, there is evidence that is directly related to the central theme of this paper, that is, the scarce preparation or training of teachers to conduct a quality online class.[3] Similarly, studies by Mitchell, (2020), Azevedo[2] and Grewenig (2020), indicate that online classes do not have the same effect on learning as face-to-face classes.

With regard to higher education, institutions had to provide different types of assistance to students from low-income families "financial aid has come in the form of scholarships, interest-free loans and access to food banks [...], they have donated devices to students, as well as internet packages so that they can go online".[4]

Results of online education: the Chilean case

The Chilean Ministry of Education, regarding the results of online teaching, presented in May 2021, through its study center, several research studies worldwide, which show the negative impact suffered by students in their learning as a result of online classes. Among these studies is that of Fitzpatrick and Mitchell, for the case of the United States (Cited in Centro de Estudios MINEDUC)[5] who argue that virtual classes do not have the same effect on learning and that it is even more complex for lower-income children. Similarly, Azevedo[2] in a study for the World Bank, using data from 157 countries, concludes that online teaching would have negative effects on learning. Similarly, a survey applied by the OECD and Harvard University in 59 countries (Centro de Estudios MINEDUC, 2021),[5] concludes that learning during the suspension of face-to-face teaching has been only a proportion of what students would have learned in schools. Another study developed in Germany (Grewenig, 2020), establishes that students with low performance would be particularly affected in their learning by the lack of face-to-face educational support. In France and the Netherlands (the latter with a high technological readiness), Engzell, Frey and Verhagen (Centro de Estudios MINEDUC, 2021),[5] reach similar conclusions that students have learned significantly less during the pandemic compared to previous years.

The Chilean regular education system has not been an exception, which has been clearly demonstrated in independent studies as well as in those conducted by the Ministry of Education itself. The results

of the research indicate that "...students could lose an average of 88% of the learning in a year, and when disaggregated by socioeconomic level, students with fewer resources could lose an average of 95% of the learning" (Centro de Estudios MINEDUC).[5]

In short, if the studies carried out confirm that remote education would not have the same results as face-to-face education and, as in the Chilean case, problems of connectivity and lack of computer equipment were verified, mainly in the most vulnerable sectors, and if, in addition, there is a lack of teachers sufficiently prepared in areas such as technological innovation and the implementation of online class systems, it is to be expected that the low results indicated will be obtained.

Lack of teacher preparation for teaching with ICTs

In addition to the problem of the low levels of learning achieved by students, there is a second problem that we are interested in highlighting, and which we strongly associate with the first: the preparation of teachers to develop online education. Regarding this problem, UNESCO[6] points out:

The emergency situation generated by COVID 19 also posed a significant challenge for teachers, as teaching online classes is a time-consuming process that cannot be done overnight (Hodges et al., 2020; Wekulloet et al., 2022). The vast majority of HEIs and their professors were not prepared for the new teaching method, as they had no previous experience in virtual environments and lacked the knowledge, skills and resources to successfully adapt their courses to the dynamics of the virtual classroom (p. 23).

In the case of the Universidad de Playa Ancha, a study conducted prior to the pandemic indicates that graduate teachers "...do not have sufficient ICT competencies that allow them to know where, when and how to use technology [...], they lack greater appropriation in the use of software, as well as Internet, communication and pedagogical management applications".[3]

What is important about this type of findings is that they were identified before the pandemic, so it can be hypothetically argued that, at the time of the pandemic, teachers were not sufficiently prepared to develop their distance classes and even less to teach them with the quality demanded by virtual teaching. However, the same study by Hidalgo[3] revealed that the use and learning of ICTs is highly valued by teachers and that they also expect training in this area to be part of their professional work. In other words, recently graduated teachers value and are motivated to receive training in innovation and in the use of technologies to strengthen their classes. This interest grew strongly during the pandemic, perhaps because of the urgent need for these tools.

The foregoing allows us to highlight the importance of technological innovation in education, the value it has had and the preeminence it gained as a result of the pandemic confinement of schoolchildren and teachers. In fact, technology -in normal times- constitutes one more of the curricular contents, however, with the arrival of the pandemic, it became essential to make up for the non-presence and to be able to continue advancing in teaching and learning. The implementation of effective online classes (adjusted to the individual contexts of each student and their family group), and of quality (in order to achieve effective learning), constituted the central strategy to minimize the detriment of virtual teaching. Visualizing the importance of the use of technologies in education (ICT), the Universidad de Playa Ancha since the 90's has prioritized and intensified innovation in the field of educational technology, both in its academics and in the initial training of teachers. This process of ICT incorporation was massified and accelerated in the national teacher training curriculum as of 2012, due to the curricular innovation that began to be implemented that year in public universities. Precisely, this process, which in the case of the UPLA, has been innovated since 2014 until now, is the one we will review below, since it is framed in the public policy of higher education.

Currently, the UPLA expects academics and graduates of pedagogy to have a training that allows them to implement ICT tools in the classroom or virtually for a better teaching and learning process. We review below the development of the policy in relation to the incorporation of ICT in education, the successes and obstacles observed, then we address the multiple and consecutive actions that UPLA has carried out in this area, we examine some difficulties and we report on progress that we consider "spearheads" of a slow process that struggles between small achievements and teachers' resistance. At the end, we will show some initiatives of hopeful progress in the implementation of ICT in initial teacher training.

The educational reform initiated in Chile in 1990 (as one of the components of the global political process known as the *Return to Democracy*), began in basic education with the Program of targeted support to nine hundred Chilean schools with low school performance, P-900. Subsequently, it is transformed into the Basic Education Quality Improvement Program (MECE Básica), in Secondary Education (MECE Media), and in Higher Education (MECE SUP), starting in 1999.[7,8]

From the beginning of the reform, the Ministry of Education made efforts to introduce ICTs in teaching and learning; thus, in 1992 it inaugurated the *Enlaces* program, creating a national network of subsidized schools and high schools linked to the same platform. In 1998, ICTs were included in the curricula and in 1999, in the document "Chile, towards the information society" of the Presidential Commission on New ICTs (1999), it was proposed to consolidate the Enlaces program and project it to teacher training (initial and in-service training). In 2001, the portal www.educarchile.cl was created with information and resources for teachers, students and their families.[9] Evidence shows the importance attributed by successive Chilean governments to the use of ICTs in regular education and, since the 2000s, to the incorporation of ICTs in initial teacher training.

However, the results of evaluations carried out at the same time as its installation in the national education system show some achievements and some shortcomings. Cancino[10] report some achievements of the Enlaces Network, as an initial ICT literacy effort, however, they emphasize, as far as the educational system itself is concerned, that there are no contributions at the curricular level (as a teaching content), nor in students' learning, revealing a partial incorporation into teaching practice, a component that - they state - conditions the educational use of ICTs. The authors conclude by suggesting that teacher training is an urgent need.

A later study, Veloso[11] highlights the fact that ICT had become a reality in Chilean education, however, and despite the investments made in technology, a large number of teachers were still illiterate in the subject and developing classes in a traditional way, very distant from the role of facilitators demanded of them: teachers lecturing and students passively listening. In short, education shows no changes with the arrival of ICTs in the classroom, which highlights the need to introduce them in initial teacher training, assuming that the new cohorts of teachers will incorporate them into their classroom

teaching. Finally, Jara and Hinostroza[12] prepare a diagnostic report that shows that, despite the progress achieved in the use of ICT and the alignment of the country with international policies in this area, the results are deficient: "particularly the challenges are concentrated in teacher training and infrastructure for internet access, especially in the poorest schools and homes" (p.4).

Although there has been progress in the generation of networks between educational establishments, in the delivery of equipment to schools and high schools, and in the basic training of students, in terms of teaching, training is still required to enable the use of ICTs in the classroom. The education pandemic (2021- 2022), as described in the first part of this paper, revealed enormous shortcomings that introduced a significant gap in student learning, particularly -as stated by Jara and Hinostroza- in students from poorer households.[12]

As regards Higher Education Institutions (HEI), the public policy supported by panels of experts, is structured around four actions to promote the improvement of the teaching staff, according to different instances: choosing the best applicants to teaching careers by raising the entrance score, improving the training of teachers in training through Performance Agreements or Framework Agreements for Initial Teacher Training, accompanying the insertion of beginning teachers and the promotion of continuous teacher improvement regulated by a Professional Teacher Development System.[13]

Now, in this same area of HEIs, the evaluations confirm the progress and shortcomings described above. The findings revealed by Hidalgo[3] for the case of UPLA, in relation to the high valuation of graduate teachers regarding the use and learning of ICT and the favorable disposition to be trained in technologies, coincide with Ortiz (2016) who concludes that "the advances in the incorporation of ICT by university professors are not the most desirable" (p.37). Echeverría[14] on the other hand, states the same, in the sense that, although teachers show good disposition and attitude to incorporate ICT in teaching, there is no concrete evidence of effective use in the classroom. If we consider that Initial Teacher Education (ITE) determines to a large extent what happens later with in-service teachers in the regular education system, the shortcomings found in the use of ICTs in university teaching suggest that they undermine the training and have an impact on the subsequent pedagogical use of technologies in schools and high schools.

National education policy and its impact on the Universidad de Playa Ancha

The national education policy assumes the concept of *quality assurance* as a criterion for evaluating initial teacher training, which includes the incorporation of ICTs. Quality and the use of technologies in teacher training are the criteria used by the Ministry of Education to invite HEIs to submit innovation projects aimed at improving initial teacher training.

Thus, in 2012, the UPLA was awarded funding to develop an Institutional Improvement Plan, Performance Agreement-UPA-1203, which marks the beginning of the process of internal diagnosis of initial training, curricular innovation and implementation of proposals for change in training. Subsequently, in 2013 and 2014, the university is awarded and develops the MECESUP projects UPA 0802, 1304, 1305, 1403, 1104 and 1001, all of which deepen evaluative actions of initial teacher training, and the implementation of various programs of innovation of the formative curriculum. In 2015, it approves the Framework Agreement FID UPA-1556, aimed at evaluating the progress of the innovation initiated in 2012. As a result of this evaluation, it approves a last FID Agreement, the Implementation Plan

2017-2019, concluded in the midst of the difficulties that teaching in pandemic implied.[15]

The projects developed by the university are oriented to the area of the training curriculum, deploying actions that involve three areas: innovation processes in teaching, academic support to student teachers (resources for learning, promotion of formative research, national and international student internships, among others) and support to teacher trainers (resources for teaching, in-service training, incentives for research and publication on FID, etc.). Regarding the first and second, the document Itinerario de la Innovación curricular 2013- 2015,[16] defines the educational model with an axis integrated by two formative lines associated with the mission of the university. One line of the Institutional Seal, which comprises a wide field of training possibilities referred to the manifestation -in the students- of behaviors and attitudes of ethical commitment, self-valuation in professional training, analytical, critical and proactive skills, creativity and/or leadership. And a second formative line associated with the Instrumental Seal, with three training blocks: development of the mother tongue, development of ICT knowledge and competences and the learning of a second language.[17]

The third area of the aforementioned triad refers to improving the quality of training, with a focus on strengthening teaching and teachers. Most of the actions that were developed together with the implementation of the innovation process in the IDF (2013 onwards), were in the field of teaching, being managed and conducted by an internal technical body of the University, under the Academic Vice-Rectory: the Teaching Improvement Unit, UMD, which, as of 2013, became the Teaching Development Unit, UDD,[18] as a result of the adoption of a conception that understands teaching work, its improvement and the construction of professional knowledge as a process and product of teachers' reflection on their practices.[19–21] This technical agency formulated and managed the project "Incorporation of ICT in university teaching. Creation of a Teaching Support Laboratory",[22] whose objectives included increasing the number of teachers trained in and using ICTs, increasing the motivation and interest of teachers in the use of ICTs, and increasing the use of virtual classrooms as a teaching support tool. However, once again, the evidence confirms what Echeverría[14] pointed out, in that teachers show a good disposition and attitude towards the use of technology, despite the stated limitations in the effective use of technology, as revealed by Hidalgo and Ibáñez.[4]

At UPLA, the figures contradict the good intentions declared in the innovation projects: after nine years of having started the implementation of innovation and having developed permanent training actions in the use of technology in teaching, only 12% of teachers use virtual classrooms during the first semester of 2018, a figure that increases to 16% in the second semester of the same year.[23] Notwithstanding the fact that, during the years of teaching in pandemic, the use of ICT in classroom practices evidences only a moderate increase, an improvement in formative practices is noted, which demonstrates an increase in the fundamental learning of students. This topic is discussed below, particularly with regard to the experience of the university's headquarters in the city of San Felipe (Valparaiso Region), reporting successful experiences that justify the institutional efforts made, and express the progress in improving training and, in particular, in the use of ICT in initial teacher training.

The use of technologies in teaching practice at the SAN felipe campus

The university has oriented the training curriculum through actions in the areas of innovation processes, and student teachers and their

teachers have participated in these actions. Regarding teachers, the internal technical body -Teaching Development Unit, UDD- began to incorporate different ICT tools in teaching through various forms of teacher training. These trainings have led some teachers to carry out digital innovation projects.

The first of these projects is the one carried out by Pérez-Lisboa,[25] Ríos and Castillo implementing a Didactic Classroom. In this new educational space, the interactive whiteboard and augmented reality were incorporated to teach different science content to children from municipal schools in the commune of San Felipe. This project lasted five years, from 2013 to 2017, a period in which various investigations were carried out, evidencing the great didactic potential of the use of augmented reality and the use of the interactive digital whiteboard. Likewise, according to the researchers "the contents worked with this material and the way they are presented in this educational intervention, through 3D images and simulations, generated great curiosity and interest in the students to learn about each of the topics".[24] Similarly, for the professional practice students of the Early Childhood Education career who implemented the methodological proposal, they were able to reflect on the current hypermedia situation and how they should include it in their daily work when developing knowledge, attitudes and skills in children.[25]

Another project is the one carried out by academics Puebla and Rodríguez, during 2018 and 2019, called: "Educational robotics in the learning of English and problem solving in mathematics: An experience with 4th grade students from two rural schools in the Aconcagua Valley". This project was executed and financed within the framework of the Incubation projects of the University's General Directorate of Linkage with the Environment. Children from educational establishments in the commune of Putaendo and Llay Llay participated, as well as five students from the English Pedagogy program. The design of the proposal was made through the use of block programming of the Scratch program, with the use of robots. These robots moved in the model of a city, to which the students gave different instructions in English, and by giving these instructions the children developed vocabulary in that second language.[26]

The aforementioned projects show the importance of incorporating ICTs in the teaching and learning process; as a result of the COVID-19 pandemic, the university had to adapt its classes remotely. This teaching modality, according to Fichten et al.,[27] implied for the teachers to adapt the subjects to online teaching with videoconference platforms, for which the management systems were often inadequate to host these subjects and, consequently, most of the students did not achieve online learning.

In spite of this, the teachers at the San Felipe Campus incorporated different teaching strategies with different ICT tools. One of these academics, Professor Caro, used Padlet, Mentimeter, Drive and the University's E-classroom platform. These tools were used to activate prior knowledge, contextualize the class and carry out metacognitive processes on the learning obtained by the students at the end of each session. With the Mentimeter tool, the teacher asked questions so that her students, through brainstorming, could deliver the contents to be learned. Through the Drive she was able to carry out different evaluations in the first year of the pandemic by means of the portfolio instrument; in the second year, she incorporated elements of E-classroom and Padlet at the request of her students because they were more dynamic and received feedback more directly. With these tools she was able to support the emotional aspect of her students (Caro, personal communication, January 5, 2023).

Professor Vera, another academic who uses ICT tools, began working with the University of Cambridge platform, with which he carried out activities and practical exercises in discrimination, listening comprehension and reading comprehension, activities that he currently performs on the university's E-classroom platform. In addition, this same teacher uses the classroom, especially in online classes, which allowed him to maintain a fluid dialogue with the students during the teaching in pandemic. He also incorporated some YouTube videos to improve comprehension of English texts. For this teacher, education is a dynamic process, in which different digital tools should be used for students to deepen their knowledge. Likewise, the teacher must consider the pedagogical intentionality of each digital tool (Vera, personal communication, January 4, 2023).

Finally, another experience corresponds to Saavedra, an academic who began to incorporate educational capsules into her online classes to deliver more specific content, since she was unable to deal with them in the limited time she had in this modality. Before creating the educational capsules, the teacher analyzed the recorded classes, thus identifying the contents to be studied in depth and the doubts presented by her students. She also elaborated different tutorials to teach the elaboration of resources and didactic materials required by special educators. With the use of both tools, she was able to support her teaching by complementing content and answering her students' questions (Saavedra, personal communication, January 17, 2023).[28–32]

Concluding remarks

The Universidad de Playa Ancha, as described above, has developed diverse and very valuable experiences of innovation in the field of incorporating ICT in initial teacher training, as a response to the serious difficulties that the system denotes in terms of its implementation in regular classrooms. Likewise, the university has taken on the challenge of public policy regarding the use of technology in teacher training and, in parallel, the mandate of the official norm (MINEDUC) on the development of competencies associated with the use of technology in student teachers, first, when they are inserted in educational institutions while they are being trained and then, upon graduation, when they begin to exercise their profession.

Indeed, the initiatives have been aimed at responding to the new curricular conceptions in the field of teaching technology, and also to meet the requirements of public policy in higher education, which - as described above - has determined as a priority the use of ICTs for two purposes: as a training strategy in teaching, and as a competence to be achieved when students graduate. The first purpose commits the university's academics, and the second is directly linked to training, enshrining the acquisition of ICT competencies in the professional profiles of graduates.

It is precisely these requirements that drive the need to be in a constant process of innovation in teacher training. This analysis has revealed some aspects that characterize innovation in a Chilean state university when it incorporates ICT into teacher training and the development of innovative teaching experiences. These are limited and contextual practices, however, they show the process of implementation of public policy in this area since they expose some curricular practices in teacher training, and reveal specific and contextual training responses of an important group of FID teachers.

All this training and innovation experience developed, expresses the effect produced by the use of technologies in teaching, which, according to Paudal (2021), should be translated into a new paradigm in the relationship between teachers and students. This paradigm became visible with the arrival of the pandemic, driving a change in

teaching and learning, leading to a global teaching style where online content development predominates (Mishraa, Gupta & Shree, 2020). In short, and according to Ewing (2021), teachers will incorporate technologies on a continuous basis if they find their usefulness after the pandemic; therefore, it will be part of the mission of HEIs to use ICTs in training in general, but especially in initial teacher training, an area where they should continue to encourage and promote their use.

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Conflcits of interest

The autor declares there is no conflicto of interest.

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