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Teacher and Context Factors Associated with the Educational Use of ICT: A Costa Rican Case Study

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Abstract: This paper studies the factors that influence the progress of teachers in Costa Rica with regards to their educational use of information and communication technologies (ICTs) in teaching and learning processes with their students. It addresses both the analysis of factors related to the figure of the teacher, their professional profile, and other factors that are external to them and are related to the context in which they practice. A qualitative method involving a case study of seven teachers was selected according to relevant and maximum variation sampling based on expert criteria. The information was collected utilizing in-depth interviews and systematic observation. The analysis of the information was based on the qualitative data analysis software program ATLAS.ti. The results highlight two categories of factors, those of the teacher, such as vocation, beliefs, teaching model, desire for personal fulfillment, or personal issues, and those of context, such as technical support and support of the management structure of the school, with more significant influence on the processes of appropriation and use of ICT in teaching practices of those factors linked to the teachers themselves.

Keywords: ICT; teaching; education

1. Introduction

There are several studies and evaluations that show the factors most related to successful experiences of inclusion of information and communication technology (ICT) in learning processes, including systemic changes in school structure, the leadership of the principal, the proper equipping of schools, the correct functioning of all technical resources, and the role of teachers who control the private space of the classroom [1–3]. The above notwithstanding, it is a fact that the contexts in which teachers work are so heterogeneous from region to region, country to country, or even continent to continent that the proposals for approaching the profession cannot be the same in all cases. The diversity of responses to this educational reality warrants further examination. The focus of this study was the emerging socio-educational scenario such as that represented by Costa Rica, within a region with significant internal differences such as Central America, and by extension, all of Latin America.

The initial approach was based on the fact that as teachers progressively acquire the competencies to include ICT in their teaching practices, their knowledge, skills, and attitudes become increasingly more sophisticated and require more flexible and complex skills. However, it should be clarified that this notion of progress should not be interpreted as occurring in discrete and sequential phases, as the development of learning in general much depends on many factors intrinsic to both people and context [1].

1.1. Educational Use and Appropriation of ICT

ICT itself currently constitutes a specific curricular area (learning how to use ICT, how it works, and how to use it responsibly and ethically), while at the same time being a cross-cutting element present in all curricula (i.e., learning a subject using ICT). Thus, its use generates an essential condition of access to learning in schools and formal and non-formal learning in general [2].

The educational use of ICT includes how teachers, as well as students, take advantage of these resources to enrich teaching and learning processes in which technology enables educational activities to access information, build knowledge, and represent it in different ways (whether in text and audiovisual formats or interactive systems). This use, therefore, is mediated by the knowledge, skills, and attitudes that teachers demonstrate when taking advantage of ICT in the critical task of teaching: classroom practices, classroom management, and their own professional development. On the other hand, the appropriation of digital technologies has also been understood as knowing how to use them and understand how to deploy them with sufficient skill to extract the necessary benefit of their potentialities in common situations of daily life [3].

This appropriation is based on the idea that incorporating ICT into the teacher's own competencies is a necessary condition for educational use to take place. That is to say, for teachers to use and maintain academic achievement in their given context, they must progress in their appropriation in order to integrate ICT into their teaching practices, making them better and more effective teachers.

The leveraging of ICT occurs due to the active use of technology; it implies both the use and deliberate and purposeful utilization of the potentialities of ICT in any task. It can be said that a person has incorporated ICT into their competencies when they find new uses for existing ICT. Appropriation involves opening a new space for dissemination between people, that is, a new space for interaction and exchange of knowledge [4].

One aspect worth highlighting is that the appropriation of ICT should not be understood solely as the operational or technical management of devices (this is only part of it) but rather a more sophisticated use that responds to specific objectives that people may have or even the modification or transformation of their function according to the user's own interests and needs. This occurs when the user understands the ICT sufficiently and can use it critically to solve problems. Drenoyianni [5] stated that the level of technical use of a specific ICT by a teacher does not determine how the teacher then implements them in the classroom. The author differentiated between the acquisition of technical competencies and the competent and effective use of a range of ICT applications to explain the critical difference between using ICT as an isolated activity and using it in a context with specific demands. One activity's requirements may differ from another's and require different competencies, including very specific competencies if they are in diverse curricular areas.

Haydn and Barton [6] pointed out that although there is a vast body of research on the best ways to include ICT in education, their application and potentialities have often been dismissed depending on the subjects being taught. For these authors, a possible understanding of the educational benefits of ICT is not derived from mastering its technical use but rather from the integrated vision that teachers have of the use of ICT in their specific subject area. This aspect supports the purpose of this study in analyzing the factors that can influence how teachers use this technology and how they harness its benefits. The study, therefore, encompassed both the technical elements involved in using ICT and a more global analysis of the teaching-learning process of teachers.

Within the construction of conditions for the educational use of ICT in Costa Rican schools and colleges, teaching staff with an adequate appropriation of ICT in their teaching practices is an unavoidable requirement. Student achievement depends, among other factors, on the performance of teachers in their teaching practices. In a study [7] developed by the Omar Dengo Foundation on the appropriation route of ICT in case studies involving schools, Costa Rican teachers were studied based on three components: their didactic models, their interactions, and their competencies. The results of this research highlight that, in general, the appropriation and use of ICT were at a basic level with regards to their practical application in activities which the teachers had previously carried out without

the benefit of these technologies. This is evidence of teachers' limitations in adjusting their didactic models toward more student-centered approaches, exploiting the full potential of all the technological tools, working collaboratively with peers, taking responsibility for their professional development, and promoting the use of ICT to extend the learning process outside the classroom.

The above notwithstanding, the study also identified cases of teachers with levels of achievement that were judged to be more sophisticated compared to the generality of the teaching population and whose characteristics and the factors that had allowed them to achieve these high levels are worth exploring in more detail. The findings derived from this research raise the need to continue delving into how educators advance based on how they deploy these primary practices, their characteristics, conditions, and the factors that influence this advance.

1.2. External and Internal Factors That Influence the Use of ICT in Teaching-Learning Processes

According to Sunkel and Trucco [8], the policies in Latin America that promote the expansion of the use of ICT in education systems have faced significant barriers in obtaining the expected impacts. These barriers appear to be related to the persistence of conventional pedagogical practices in schools, the non-existence within the curricula of guidelines for the educational use of ICT, the inadequate training for principals and teachers that are contemplated in policies, and institutional rigidity and isolation. The authors find in these factors most of the explanations for the slow advance of ICT initiatives in education. In the context of this study, the contribution of these authors represents relevant enlightenment when it comes to outlining the supra-categorical framework that guides the analysis of the information.

Kihoza et al. [9] evaluated the opportunities for integrating ICT in the classroom concerning the technological and pedagogical learning model (technological pedagogical content knowledge, TPACK) [10] and the SAMR model (substitution, argumentation, modification, and redefinition) of [11]. Among its main findings, the study highlighted that most participants had a low level of ICT-related skills. However, the teachers showed an adequate level of knowledge in the TPACK and SAMR models.

Wang [12] studied the factors that influence educators about the conceptualization of TPACK, and therefore their inclusion of ICT in lesson planning. These factors are related to the physical, technological, cultural/institutional, interpersonal, and intrapersonal contexts. The authors' principal findings determined that cultural/institutional factors may disfavor teachers' conceptualization of TPACK. In comparison, factors more closely related to the intrapersonal context (such as their teaching beliefs and beliefs about their students' abilities) are conducive to a better understanding of the TPACK and its implementation.

This study also analyzed the unified theory of acceptance and use of technology (UTAUT) and the technology acceptance model (TAM) as possible references that would have enriched its analysis and theoretical construction.

While the TAM has been widely used in this research field, its authors have frequently revised and rethought it. In addition, it focuses on an isolated technology, specifically, the use of computers, and does not delve into the adoption of more recent mobile technologies and cultural and social context variables.

In the case of the UTAUT, while the theoretical context is similar, its principal difference lies in that it is, above all, a predictive model with many associated variables in some dissident cases that, in many cases, does not allow for focused analysis. As a result, the model was not considered consistent with the scope and focus of this qualitative research.

Van den Beemt and Diepstraten [13] developed the concept of learning ecology understood as being " ... the complete set of contexts that provide teachers with opportunities to learn" (p. 161). In this set of contexts, the authors identified several sociocultural factors such as places, activities, and other people that influence the way educators manage their learning environment. The proposal is oriented toward the professional development processes necessary for using ICT and their beliefs and attitudes related to these uses. They indicate that teachers' pedagogical beliefs and initial experiences

are variables that influence the adoption of ICT. These, in turn, are influenced by sociocultural factors such as their educational training or the family structures to which they are accustomed. In the concept of learning ecology, the idea of development over time in how teachers use resources is essential, for example, in developing skills related to the use of ICT.

As a vital step in the preliminary approach to this interpretive research, it was deemed necessary to draw a map of teachers' learning ecology concerning their educational use of ICT. The map serves to analyze their first experiences of use, how that use has been transformed, and the beliefs and attitudes that have been generated around the subject and identify other variables that have influenced this evolution and that may be typical of more external systems.

Brenes et al. [7] developed, through case studies, a diagram of existing conditions in the institutions that promote or hinder the use of mobile technologies in Costa Rica. Specifically, this diagram makes a preliminary map of the significant areas in which the factors that come into play in schools and colleges regarding ICT use in this region can be found.

The approach mentioned above, carried out in Costa Rica, was combined, in turn, with a mapping based on various investigations [7,13–20] that analyze the factors involved in the educational use of ICT by teachers. From a theoretical point of view, these studies serve to inform the pre-categorization of questions that guided this investigation, answering the fundamental question of what factors, whether intrinsic to the teacher or external to the context, influence the educational use of ICT by Costa Rican teachers. While this research was carried out using a qualitative research approach, it is understood that it is open to the emergence of new specific categorical elements not initially contemplated.

2. Methodology

This study was based on a qualitative approach with an interpretive, in-depth, and emergent analysis of analyzed realities. It was designed as a qualitative case study. This approach facilitates the construction of practical, flexible research designs capable of exploring phenomena in depth in real contexts and across various disciplines [14,21–23].

2.1. Objectives

This study aimed to analyze the factors that influence the educational use of ICT by teachers. It also aimed to identify and characterize the categories in which the factors that influence the educational use of ICT by teachers can be grouped.

2.2. Participants

A sample of test or representative cases [24] was chosen as part of the methodological processes used to analyze, explore, describe, and study in-depth the factors associated with the educational use of ICT by teachers.

The progress made by seven teachers in the use of ICT in their classrooms and associated factors was studied. Based on a certain number of test cases of teachers with common traits taken from among the population of Costa Rican teachers from diverse educational cycles, a degree of depth and richness of information was sought. The selection and suitability of the participants were based on their experience and competence profile (basic or advanced). Another factor taken into account was their participation in educational proposals for the use of ICT in the classroom according to the educational modality and grade taught, such as Tecnoambientes and TecnoAprender in early childhood (PRONIE MEP-FOD and MEP) (National Programs in Educational Computing), Mobile Technologies in rural high schools (Rema and Tecno Rural, PRONIE MEP-FOD), Mobile Technologies in Unidocentes (single-teacher) and Dirección 1 schools (ATEM from PRONIE MEP-FOD and TecnoAprender Primaria from MEP), Movilab primary schools and Mobile Technologies in secondary schools (Movilab from PRONIE MEP-FOD and TecnoAprender High School from MEP). Given that the participants selected

were active teachers participating in educational proposals related to ICT, it was confirmed that they had access to relevant ICT resources for use in the teaching and learning process.

The selection of the seven teachers, in total, met the following inclusion criteria:

1. Have at least three years of experience teaching in ICT learning environments.
2. Have received a process of pedagogical induction or initial training in the use of ICT in the classroom.
3. The availability of technological equipment in good condition or functioning in the classroom.
4. Possession of at least a university bachelor or other higher degrees in the subject area they teach.
5. Willingness to participate in the study.

A balanced representation in terms of gender with at least one man and one woman per level was sought. However, only women were selected for the preschool level due to the high female representation in early childhood education in Costa Rica. The selection of the seven teachers was made through expert criteria. The MEP works with pedagogical advisers who lead and give advice and support teachers in the regions. For each level, the recommendations of advisers from the MEP and PRONIE MEP-FOD were sought to find teachers who met the inclusion criteria set out above but also one related to the performance level of their teaching practice, whether basic or advanced, using ICT, according to criteria described in Table 1.

Table 1. Criteria used for the selection of participating teachers. ICT: information and communication technology.

Basic Teaching Practice Using ICT	Advanced Teaching Practice Using ICT
- Requires a lot of motivation and monitoring to include ICT in the classroom, seldom uses ICT, or uses it due to pressure from the principal. - Has fears and insecurities regarding the use of ICT in the classroom. - The activities carried out with ICT do not exceed the search for topics on the Internet or presentations. - The teacher is passive within the collaboration dynamics of the institution and is not recognized as being a teacher with leadership in this area.	- Evidence of personal motivation to include ICT as part of their usual practices in the classroom. - The activities carried out with ICT are preferably oriented to developing communication, collaboration, or problem-solving skills, without forgetting the approach to curricular issues. - The teacher is recognized within the institution for being a leader among colleagues regarding the inclusion of ICT in teaching and learning processes.

An analysis of the participating teachers' teaching performance resulted in several differentiated profiles based on specific traits. The teachers' profiles are referred to by a number, one through seven, in order to safeguard confidentiality. The following is a detailed description of each test case recommended by the experts:

- Teacher 1 evinces an advanced profile, works in a multigrade school (heterogeneous classroom with students of different levels from first to sixth grade), has less than five years of experience, studied at a public university, has a bachelor's degree, and works in a rural area.
- Teacher 2 displays an advanced profile, works in a regular academic high school as an English teacher, has less than five years of experience, studied at a private university, has a bachelor's degree, and works in an urban area.
- Teacher 3 evinces an advanced profile, works in a regular elementary school teaching the third grade, has more than ten years of experience, studied at a public university, has a bachelor's degree, and works in a rural area.
- Teacher 4 evinces a basic profile, works in a rural high school as a Spanish language teacher, has more than five years of experience, studied at a private university, has a bachelor's degree, and works in a rural area.

- Teacher 5 manifests a basic profile, works in a kindergarten, has more than 15 years of experience, studied at a private university, has a master's degree, and works in an urban area.
- Teacher 6 displays an initial profile, works in a preschool kindergarten, has more than 20 years of experience, studied at a public university, has a master's degree, and works in an urban area.
- Teacher 7 displays a basic profile, works in a multigrade primary school (heterogeneous classroom with students of different levels from first to sixth grade), has more than 20 years of experience, studied at a private university, has a master's degree, and works in a rural area.

Specific techniques were used during the data collection phase to make it possible to contrast the information collected in each case study. The techniques used are the following:

1. Class observations that include the use of ICT;
2. In-depth interviews;
3. Self-assessment scale of performance in the use of ICT.

The instruments that accompany this research are included in Supplementary Materials (Appendices 1, 2, and 3).

For the definition of these collection processes and the construction of the respective instrumentation, an operational table of categories and subcategories of analysis that guided the construction of instruments and subsequent analysis was developed a priori and a posteriori, along with their respective conceptual and instrumental definitions (Appendix 4 in Supplementary Materials).

2.3. Processing and Analysis of Information

The information was collected over 13 months. The initial data were obtained through class observations of each teacher for 240 min and the completion of a self-assessment scale of performance in the use of ICT. The aim of this self-assessment was not to conduct a quantitative analysis but rather to obtain specific information from each teacher that would later be addressed in a subsequent in-depth interview. Before the interview, each teacher presented a lesson plan that included the use of ICT in the classroom. The cumulative qualitative analysis of the information from each collection phase led to the specific investigation of analytical findings in the next stage. The nature and complexity of the problem analyzed on the progress of teachers in their educational use of ICT implied an iterative process, rather than one which was linear, in which collection actions were carried out that delved into the problem as a means of finding robust interpretations through linkages between the data.

The analysis carried out was based on a hermeneutical procedure for data reduction in three coding phases: open, axial, and selective. This type of research corresponds to the constant comparative method [25]. To this end, the information collected was refined, systematized, and incorporated into a hermeneutical unit integrated into the ATLAS.ti software.

The information was structured in hermeneutical units for analysis. In total, the collection process resulted in 28 primary base documents selected from 68 documents that were supported by a range of support documentation, depending on the requirements and information collection for each case, including audio recordings of interviews, photographs of the learning environment, description of observations, and lesson plans. The final analysis resulted in 23 categories and 264 subcategories.

3. Results

The findings of the analysis of the factors influencing the inclusion of ICT show a tendency toward the attribution of variables related to the teachers themselves, compared to other variables, though to a lesser extent and related to the context in which the teachers work.

Similar to Van den Beemt and Diepstraten's study [13], the learning ecology of these teachers was explored through sociocultural factors such as places, activities, and dynamics that constitute different contexts in which teachers have opportunities to learn. Qualitative data analysis that focused on exploring these factors resulted in the analytical subcategories shown in Table 2.

Table 2. Analytical subcategories from data analysis in ATLAS.ti.

Analytical Subcategories	Number of Information Extracts on Which It Is Based
Of the Teacher	
Search for personal fulfillment in the teaching profession	6
Teaching model pursued	15
Indication of teaching vocation	23
Perceived experience	15
Beliefs about teaching	4
Personal and social characteristics	10
Of the Context	
Perceived support from the principal or leadership	12
Limits to access to resources, internet connectivity, and infrastructure to make better use of ICT in the classroom	14

3.1. Teacher Factors

When referring to the "search for personal fulfillment" factor, the aim is to denote aspects that the teacher identifies as contributing to achieving their personal goals, to their teaching practice, and that motivate them as teachers. Closely related to this is the "teaching model pursued", which refers to those archetypes of teaching that are the product of the personal learning experience and which teachers consider to be their inspirational vision of what it means to be a good teacher [26,27].

The factor related to the "teaching vocation" refers to that central disposition that teachers demonstrate for selecting this career in the first place and to working with students with joy and dedication. These three factors represent psychological elements related to the teacher as a working person seeking personal well-being. This factor is highlighted because, in order to map the ecology of teachers' learning, it is necessary to analyze their first experiences of ICT use, how that use has changed, the beliefs and attitudes generated around the subject, and other variables that have influenced this evolution [13].

On the other hand, the "perceived experience" factor refers to the transformations or changes resulting from their teaching trajectory and what they perceive that they have achieved. The factor "beliefs about teaching" is linked to the ideas or concepts that teachers have about what characterizes teaching and learning. Finally, "personal and social characteristics" are specific characteristics of teachers regarding generational groups to which they belong, training centers, and educational level. All of these are factors that have been studied and analyzed in detail [15,16,19,28,29]. When the analysis of these factors was carried out on the cases of participating teachers, common trends were identified. These factors are displayed, by case study, in Figure 1.

Factor	*Teacher 1*	*Teacher 2*	*Teacher 3*	*Teacher 4*	*Teacher 5*	*Teacher 6*	*Teacher 7*
Performance	Excellent	Satisfactory	Satisfactory	Satisfactory	To be improved	To be improved	Unsatisfactory
Personal fulfilment goal	To have an effective teaching practice	To feel close to their students	To feel close to their students	To have an effective teaching practice	To feel close to their students	To feel close to their students	To have an effective teaching practice
Teaching method	An inspiring teacher who finds well-being in their practice	A teacher who assists student to visualize what they learn	An organized and responsible teacher	A problem-solving teacher	A caring and rigorous teacher	A teacher who cares for the student as a whole	A teacher who explains things well and pays attention to students
Teaching Vocation	There was an initial motivation to study education	There was an initial motivation to study education	There was no initial motivation to study education	No initial motivation to study for a degree in education	There was no initial motivation to study education	There was an initial motivation to study education	There was an initial motivation to study education
Perceived Experience	Increasingly focused on student-centered practices	Increasingly able to anticipate which activities have better outcomes	Improvement in pedagogical and teaching practices	Improvement in pedagogical and teaching practices	Improvement in identifying pedagogical and teaching practices	Increasingly able to anticipate which activities have better outcomes	Increasingly able to anticipate which activities have better outcomes
Teaching Beliefs	Teaching is building knowledge	Teaching is achieving the expected outcomes from students	Teaching is building knowledge	Teaching is achieving the expected outcomes from students	Teaching is achieving the expected outcomes from students	Teaching is helping students to be become autonomous	Teaching is achieving the expected outcomes from students
Personal and social characteristics	Rural area Bachelor´s degree from a Public University Aged between 20 and 30	Urban area Bachelor´s degree from a Public/Private University Aged between 30 and 40	Rural area Master´s degree from a Public University Aged between 30 and 40	Rural area Master´s degree from a Private University Aged between 30 and 40	Urban area Master´s degree from a Private University Aged between 50 and 60	Urban area Master´s degree from a Public/Private University Aged between 50 and 60	Rural area Bachelor´s degree from a Private University Aged between 40 and 50

Figure 1. Factors of the teacher by case studied. Our own compilation.

In the "search for personal fulfillment" factor, teachers mainly point to goals related to their emotional life and interpersonal relationships and other goals more closely associated with effectiveness in their profession. Regarding the teaching model factor, this revolves around archetypes of inspiration, love, rigor, order, responsibility, and autonomy. The factor of "teaching vocation" was evaluated by identifying the teacher's initial motivations for studying for a degree in education. This factor seems to be a trend more associated with gender since, unlike their male counterparts, all the female teachers had considered being educators before entering university.

By integrating three pivotal factors ("search for personal fulfillment", "teaching model", and "teaching vocation"), it is possible to identify the best performing teachers. These teachers are characterized by their efforts in developing effective teaching practices, on their inspiration models, and on mastering specific teaching techniques such as generating metacognition, order, and problem-solving. For example,

> *Ehhh . . . yes, let's say that how you learn to plan and how you then apply it in real life is totally different. For example, the planning you did at university has nothing to do with what you do in the classroom. You learn how to plan, and you also learn from other teachers, even more so now that everything is changing so much. Policies are changing, and every so often, they have to be updated. Still, there are changes... I think, well, now that the school has taken the initiative only to set one test per term, and that is better because it gives us a chance to do more with the children, like better activities such as workshops, to expand their knowledge. In the past, they had to rush to study more*

> *for the exams. So, for me, it has been a good change..., when I started, there were many things that I did not know. For example, when setting tests, I did not realize that they had to have a table of specifications; I did not know anything. That is something you only learn when you begin to teach . . .* (Excerpt from the interview with Teacher 3).

With regards to the "perceived experience" factor, teachers mainly discerned changes based on their trajectory. They stated that their practice had become more student-focused, how they were better able to determine which activities would work, how their practice had changed pedagogically and didactically (including planning, taking tests, and managing time), and how they had improved their ability to discern the needs of students.

> *Yes, obviously. When you start, you are so inexperienced that sometimes you don't know how to do anything. Suddenly you use something and it might not work for you. For example, you carry out an activity thinking; this will be a blast- right? And then you get to class and realize that reality is different. So, it's like that. For example, I have concluded that if on Friday or Saturday afternoon, I set myself the task of creating a great activity. Then I say to myself, "well, that's a great activity; let's see if it works with the first group. If it doesn't, then I have to innovate for the second group or make changes for the third... You have to be mentally prepared to admit that not everything that you prepare is going to work and that many things have to be changed-right?* (Excerpt from the interview with Teacher 2).

Regarding the factor, "beliefs about teaching", the teachers described their teaching as building knowledge with students, achieving previously set outcomes, or helping students to become more autonomous. It is possible to show how their beliefs about teaching are inclined toward changes in student-centered approaches and better pedagogical and didactic practices:

> *I feel that one does change because it makes you focus on what you want to teach. Sometimes I had certain expectations, and then I taught the class according to these expectations or what I thought I wanted to achieve. But after teaching, you become more focused on what is best for the student, and that can generate learning situations that are more attractive for them and allow them to create more knowledge* (Excerpt from the interview with Teacher 1).

Finally, in terms of "personal and social characteristics", it is possible to point out that the teachers who show better performance profiles are found in younger generational groups and those who underwent their initial training in public universities.

3.2. Context Factors

Regarding factors related to the context in which the teachers practiced, two of the factors investigated were "perceived support from regional authorities" and "technical support". These factors were reflected in the limited access to resources, internet connectivity, and the presence (or not) of infrastructure to better use ICT in the classroom. All teachers were consistent in their answers:

- There is no perceived support from regional authorities for the use of ICT in the classroom.
- The national curriculum does not state, nor does it suggest, how ICT should be used in each subject, and thus it becomes the exclusive task of each teacher.
- The technical support that the educational centers receive is of high quality in terms of time and efficiency, resulting in computers functioning correctly.

The analysis of these factors is reflected in Figure 2 by case study.

Factor	*Teacher 1*	*Teacher 2*	*Teacher 3*	*Teacher 4*	*Teacher 5*	*Teacher 6*	*Teacher 7*
Access to resources and facilities	Digital blackboard, overhead projector, printer, own classroom and PC	Overhead projector, the teacher does not have their own classroom	Overhead projector, own classroom	Overhead projector, own classroom and personal computer	Overhead projector, digital screen, personal computer	Overhead projector, own classroom	Overhead projector, own classroom and personal computer
Internet Connection	Yes with stable connectivity	Yes, but with unstable connectivity	Yes, but with unstable connectivity	No. Internet is only available in one classroom	Yes, but with unstable connectivity	No	No
Computer Equipment	One computer per student	Computer Lab	Computer Lab	One computer per student	One computer shared by 4 students	One computer shared by 4 students	One computer per student
Support from Principal	Positive support and motivation	Non-existent support is perceived	Positive support and motivation	Positive support	Positive support	Non-existent support is perceived	Not applicable (the teacher is also the principal)

Figure 2. Context factors by case studied.

Once again, with regards to these context factors, it is difficult to determine any trend. However, it is evident that Teacher 1 enjoys ICT infrastructure the best and has access to all the resources they need, including connectivity, equipment to which all students have access, and a principal who not only supports their teaching practice but also motivates them to improve their classroom projects.

> *The principal is a supportive and motivational figure. This year, thank God, the principal I work with now is very open and understands my methodology. In some cases, let's say, it may not be one he would use, but he does look in and sees that the little ones are having fun. I think that he is supportive* (Excerpt from the interview with Teacher 1).

The quality of Internet connectivity and the principal's perceived support appear to be influential conditions, especially for teachers who have demonstrated suitable performances. Concerning the availability of computing equipment, those teachers who only have one computer shared by a certain number of students pointed to this condition as something that impairs their classroom performance.

> *. . . my problem is that I would prefer more computers in the classroom because there are only ehhh . . . 4, ehhh . . . 5 in each one, this is too few given the number of children* (Excerpt from the interview with Teacher 5).

4. Discussion

On a general level, our research seems to reveal the existence of relatively constant factors, grouped into two large supra-categories: teacher factors and contextual factors. This is compatible with the review by Mumtaz [30] who, over 20 years ago, recognized three interlocking factors that affect the use and adoption of ICT by teachers: the institution, the resources, and the teacher.

In particular, this study found factors such as beliefs that have a confirmed role. The views of the participating teachers focused on teaching as building knowledge with students, on achieving the expected outcomes from students, and helping them become more autonomous. These results are more in line with those of Sang et al. [31] or, more recently, those of Habibi et al. [32]. All this without

forgetting commonalities with Sang et al. (2011) [31] concerning the motivational disposition in the present study is referred to as a vocation.

The complexity of identifying the greater or lesser degree of impact of the different factors involved in the integration of ICT by teachers agrees with the research of Aslan and Zhu [15], Asmalı and Çelik [27], Baydas and Goktas [17], and Gil-Flores, Rodríguez-Santero, and Torres-Gordillo [19].

In the present study, the factor of experience points to the fact that there is no direct or inverse projection on the participating teachers' appropriation and use of ICT. Instead, it is more closely related to other more pre-dispositional factors. To some extent, this is in contrast to the results of Ibieta et al. [33], who stated that less experienced teachers used ICT the most in their teaching practices, albeit more in extra-classroom teaching tasks than within the classroom itself, or the findings of Ifinedo et al. [34] who point to experience as a relevant factor in the use of ICT by teachers.

However, this investigation agrees with the studies by Li et al. [35] and Sundqvist et al. [36] in pointing out that, in general terms, the competence of teachers explains the integrative aspect of ICT. This study also agrees with these authors on the importance of endogenous factors and found less relevant factors related to traditional contexts such as technical resources and equipment.

It is interesting to note that in this study, perhaps due to the presence of single-teacher schools in Costa Rica, the factor of teacher cooperation did not emerge when explaining the integration and use of ICT. This is in partial agreement with Drossel et al. [37], although Li et al. [35] pointed it out as a relevant factor. However, this qualitative study agrees with Wang et al. [38] in that, in rural schools, personal factors are still more important than context factors.

Concerning the factor of age, our study showed partial coincidences that point toward a relative agreement with Lawrence and Tar [39] in the sense that younger generations tend to facilitate the use of ICT by students. However, given the methodological limitations of this research, it is risky to highlight such a specific variable.

5. Conclusions

Regarding the factors of teacher and context associated with the educational use of ICT, it can be concluded that:

1. It is difficult to attribute a greater or lesser association of the factors identified with teachers' performance, especially since the participants turn out to be a relatively homogeneous group of teachers in terms of their favorable dispositions toward teaching and the use of ICT in general.
2. However, it is worth highlighting that their teaching practices are more focused on effective teaching, inspiration models, and mastery of teaching techniques.
3. In terms of teacher factors, there are common trends. In the "search for personal fulfillment" factor, teachers mainly point to elements related to their emotional life, interpersonal relationships, and goals related to being effective in their work. With regards to the teaching model pursued, the factors tend to lean toward archetypes of inspiration, love, rigor, order, responsibility, and autonomy. In the "teaching vocation" factor, a trend more associated with gender can be seen since, unlike their male counterparts, all the female educators had considered being educators before entering university.
4. In the "perceived experience" factor, all the teachers discerned changes in their trajectory toward a more student-centered practice, their ability to determine which activities would work, how their pedagogical and didactic practices have changed, and how they had improved their ability to identify the needs of students.
5. The teaching beliefs of these teachers focused on the belief that teaching is building knowledge with students, that it is the achievement of outcomes by students, and that their role is helping students achieve greater autonomy.
6. As to the context factors, the perceived support from regional authorities and technical support were investigated. However, all the teachers consistently stated that there was no perceived

support from regional authorities regarding the use of ICT in the classroom. Thus it became the exclusive task of each teacher. However, they stated that the technical support that educational centers receive is of high quality in terms of time and efficiency, resulting in computer equipment that functions correctly.

7. It is worth noting that the educator rated with the best performance enjoys better conditions associated with the use of ICT in the classroom, access to all the resources needed, stable connectivity, equipment that all students can access, and a principal who not only offers support but also motivates them to continue developing classroom projects.

6. Limitations and Recommendations for Future Research

This qualitative study can be considered an initial approximation to other types of quantitative studies that could either verify or analyze in greater depth the skills developed by teachers or map the progress of larger populations of teachers.

Although, as previously referenced, there is a wide range of studies analyzing the factors that favor or limit the inclusion of ICT in educational processes, few seek to determine the link between these factors and teachers' performance levels.

In the case of the present investigation, the analysis carried out was unable to relate these factors with the progress of the teachers. Thus it is necessary to continue to analyze these factors in greater depth and with other analytical techniques.

7. Ethical Considerations

To carry out the proposed investigative process, a series of ethical principles necessary for working with people as sources of information in educational research was considered and follows the Code of Good Research Practices of the University of Almería (UAL, 2011). The principles are as follows:

1. Consent: each participating teacher is given a detailed explanation of the objectives sought, their willingness to participate, the benefits they will receive, and the risks involved. For this, an Informed Consent will be used that will be read, and copies made (one copy to be filed and one copy to be given to each participant).
2. Confidentiality and anonymity: participating teachers will be informed that the information collected will be strictly confidential and anonymous for reporting purposes. The study will not give names or details that could identify the informants.
3. Risk management: it will be clearly explained that the research seeks to collect data to describe and analyze an educational reality, but it will not judge its actions, nor does it have profit objectives.
4. Respect for autonomy: it will be clarified to the participants that they have the right to request that aspects of the data they perceive to harm them and collected from them in the investigation not be reported.
5. Honesty, responsibility, and rigor: the information collected will be analyzed and reported according to the data's fidelity without manipulating the same in benefit of the objectives.
6. Transfer and protection of the results: the data collected will be recorded and systematized rigorously so that the necessary information about the person who collected them and the date can be identified. They will be secured digitally for a period of three years after the completion of the investigation.

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References

1. Griffin, P.; Care, E. Pathways of Educational Leadership: Monitoring and Developing Skill Levels among Educational Leaders in Australia. In *School Leadership in the Context of Standards-Based Reform*; Springer Science and Business Media LLC: Dordrecht, The Netherlands, 2012; pp. 95–120.
2. Coll, C.; Monereo, C. Educación y aprendizaje en el siglo XXI: nuevas herramientas, nuevos escenarios, nuevas finalidades. In *Psicología de la Educación Virtual: Aprender y Enseñar con las Tecnologías de la Información y la Comunicación*; Coll, C., Monereo, C., Eds.; Ediciones Morata: Madrid, Spain, 2008; pp. 20–53.
3. Fundación Omar Dengo. *Estándares Para Estudiantes en Aprendizaje con Tecnologías Móviles*; Fundación Omar Dengo: San José, Costa Rica, 2008.
4. Flint, T.; Turner, P. Enactive appropriation. *AI Soc.* **2015**, *31*, 41–49. [CrossRef]
5. Drenoyianni, H. Designing and Implementing a Project-Based ICT Course in a Teacher Education Setting: Rewards and Pitfalls. *Educ. Inf. Technol.* **2004**, *9*, 387–404. [CrossRef]
6. Haydn, T.; Barton, R. Common needs and different agendas: How trainee teachers make progress in their ability to use ICT in subject teaching. Some lessons from the UK. *Comput. Educ.* **2007**, *49*, 1018–1036. [CrossRef]
7. Brenes, M.; Villalobos, M.; Escalona, M.; Zúñiga, M. *Niveles de Apropiación de las Tecnologías Móviles en Centros Educativos. Aportes a los Procesos de Enseñanza-Aprendizaje y de Gestión Escolar*; IV Informe del Estado de la Educación; Consejo Nacional de Rectores-CONARE: San José, Costa Rica, 2017.
8. Sunkel, G.; Trucco, D. *Las tecnologías digitales frente a los desafíos de una educación inclusiva en América Latina: Algunos casos de buenas prácticas*; United Nations: Santiago, Chile, 2012.
9. Kihoza, P.; Zlotnikova, I.; Bada, J.; Kalegele, K. Classroom ICT integration in Tanzania: Opportunities and challenges from the perspectives of TPACK and SAMR models. *Int. J. Educ. Dev. Using Inf. Commun. Technol.* **2016**, *12*, 107–128.
10. Koehler, M.J.; Mishra, P.; Cain, W. What is Technological Pedagogical Content Knowledge (TPACK)? *J. Educ.* **2013**, *193*, 13–19. [CrossRef]
11. Puentedura, R. SAMR and Bloom's Taxonomy: Assembling the Puzzle. Available online: https://www.graphite.org/blog/samr-and-blooms-taxonomy-assembling-the-puzzle (accessed on 24 September 2014).
12. Wang, A.Y. The impact of digital storytelling on the development of TPACK among student teachers in Taiwan. In *The Handbook of Technological Pedagogical Content Knowledge (TPACK) for Educators*; Herring, M.C., Koehler, M.J., Mishra, P., Eds.; Routledge: London, UK, 2016; pp. 297–308.
13. Beemt, A.V.D.; Diepstraten, I. Teacher perspectives on ICT: A learning ecology approach. *Comput. Educ.* **2016**, *92*, 161–170. [CrossRef]
14. Kazez, R. Los estudios de caso y el problema de la selección de la muestra Aportes del Sistema de Matrices de Datos. *Subj. Procesos Cogn.* **2009**, *13*, 1–17.
15. Aslan, A.; Zhu, C. Influencing Factors and Integration of ICT into Teaching Practices of Pre-service and Starting Teachers. *Int. J. Res. Educ. Sci.* **2016**, *2*, 359. [CrossRef]
16. Badia, A.; Meneses, J.; Sigalés, C.; Fàbregues, S. Factors Affecting School Teachers' Perceptions of the Instructional Benefits of Digital Technology. *Procedia-Soc. Behav. Sci.* **2014**, *141*, 357–362. [CrossRef]
17. Baydas, O.; Goktas, Y. Influential factors on preservice teachers' intentions to use ICT in future lessons. *Comput. Hum. Behav.* **2016**, *56*, 170–178. [CrossRef]
18. Colás Bravo, P.; Casanova Correa, J. Variables docentes y de centro que generan buenas prácticas con tic. Teoría de la Educación. *Educ. Cult. Soc. Inf.* **2010**, *11*, 121–147.
19. Gil Flores, J.; Rodríguez-Santero, J.; Torres-Gordillo, J.-J. Factors that explain the use of ICT in secondary-education classrooms: The role of teacher characteristics and school infrastructure. *Comput. Hum. Behav.* **2017**, *68*, 441–449. [CrossRef]
20. Zúñiga, M.; Núñez, O.; Brenes, M.; Chacón, D. *La Ruta Hacia la Apropiación de las TIC en los Educadores Costarricenses*; IV Informe del Estado de la Educación; Consejo Nacional de Rectores-CONARE: San José, Costa Rica, 2015.

21. Harrison, H.; Birks, M.; Franklin, R.; Mills, J. Case Study Research: Foundations and Methodological Orientations. *Qual. Soc. Res.* **2017**, *18*, 1–12.
22. Hernández-Sampieri, S.; Fernández-Collado, C.; Baptista-Lucio, M. *Metodología de la Investigación*, 6th ed.; McGraw-Hill: México D-F, Mexico, 2014.
23. Flyvbjerg, B. Five Misunderstandings About Case-Study Research. *Qual. Inq.* **2006**, *12*, 219–245. [CrossRef]
24. Quintana Peña, A. Metodología de investigación científica cualitativa. In *Psicología: Tópicos de Actualidad*; Quintana, A., Montgomery, W., Eds.; UNMSM: Lima, Perú, 2006; pp. 47–84.
25. Strauss, A.L.; Corbin, J. *Bases de la Investigación Cualitativa: Técnicas y Procedimientos Para Desarrollar la Teoría Fundada*, 1st ed.; Editorial Universidad de Antioquia: Medellín, Colombia, 2002.
26. Demir, Y. A Meta-summary of the Research on Metaphors Regarding Turkish EFL Teachers' Roles. *Adv. Lang. Lit. Stud.* **2018**, *9*, 65–76. [CrossRef]
27. Asmalı, M.; Çelik, H. EFL teachers' conceptualizations of their roles through metaphor analysis. *J. Lang. Linguist. Stud.* **2017**, *13*, 1–13.
28. Carstens, R.; Pelgrum, W.J. Second Information Technology in Education Study: SITES 2006 Technical Report. The International Association for the Evaluation of Educational Achievement (IEA). 2007. Available online: https://web-proxy.io/proxy/hdl.handle.net/10062/40799 (accessed on 24 September 2020).
29. Suárez-Rodríguez, J.; Cerveró, G.A.; Orellana, N.; Díaz-García, I. A basic model of integration of ICT by teachers: competence and use. *Educ. Technol. Res. Dev.* **2018**, *66*, 1165–1187. [CrossRef]
30. Mumtaz, S. Factors affecting teachers' use of information and communications technology: A review of the literature. *J. Inf. Technol. Teach. Educ.* **2000**, *9*, 319–342.
31. Sang, G.; Valcke, M.; Van Braak, J.; Tondeur, J.; Zhu, C. Predicting ICT integration into classroom teaching in Chinese primary schools: exploring the complex interplay of teacher-related variables. *J. Comput. Assist. Learn.* **2010**, *27*, 160–172. [CrossRef]
32. Habibi, A.; Yusop, F.D.; Razak, R.A. The dataset for validation of factors affecting pre-service teachers' use of ICT during teaching practices: Indonesian context. *Data Brief* **2020**, *28*, 104875. [CrossRef]
33. Ibieta, A.; Hinostroza, J.E.; Labbé, C.; Claro, M. The role of the Internet in teachers' professional practice: Activities and factors associated with teacher use of ICT inside and outside the classroom. *Technol. Pedagog. Educ.* **2017**, *26*, 425–438. [CrossRef]
34. Ifinedo, E.; Rikala, J.; Hämäläinen, T. Factors affecting Nigerian teacher educators' technology integration: Considering characteristics, knowledge constructs, ICT Pract. Beliefs. *Comput. Educ.* **2020**, *146*, 103760. [CrossRef]
35. Li, S.; Yamaguchi, S.; Takada, J.I. Understanding factors affecting primary school teachers' use of ICT for student-centered education in Mongolia. *Int. J. Educ. Dev. Using ICT* **2018**, *14*, 103–117.
36. Sundqvist, K.; Korhonen, J.; Eklund, G. Predicting Finnish subject-teachers' ICT use in Home Economics based on teacher- and school-level factors. *Educ. Inq.* **2020**, 1–21. [CrossRef]
37. Drossel, K.; Eickelmann, B.; Gerick, J. Predictors of teachers' use of ICT in school–the relevance of school characteristics, teachers' attitudes and teacher collaboration. *Educ. Inf. Technol.* **2017**, *22*, 551–573. [CrossRef]
38. Wang, J.; Tigelaar, D.E.H.; Admiraal, W. Connecting rural schools to quality education: Rural teachers' use of digital educational resources. *Comput. Hum. Behav.* **2019**, *101*, 68–76. [CrossRef]
39. Lawrence, J.E.; Tar, U.A. Factors that influence teachers' adoption and integration of ICT in teaching/learning process. *Educ. Media Int.* **2018**, *55*, 79–105. [CrossRef]