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Local Strategies and Models for Availability and Access to Information and Communication Technologies in a Rural Elementary School in Mexico

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ABSTRACT

This article, which is based on an ethnographic approach, analyses the models and strategies that a rural elementary school community in Mexico has developed to keep available, accessible, and in daily use, digital devices and connectivity despite their marginality conditions. This case study is explored from two theoretical perspectives. First, a critical approach to digital inclusion policies in Latin America (Dussel 2014; González 2014) is used to understand how the school community has *translated* digital inclusion policies to build their own availability models. Second, the access of the school community to ICT is examined under the scope of a literacy access perspective (Street 2016) in order to understand ICT practices according to discourses and ideology that surround practices, the community and institutional structures that support participation, and the relationships with other people who model and promote ways of using ICT (Hernández & López 2019; Kalman & Hernández 2018; Warschauer 2003). This analysis shows the local strategies that allow the school community to keep availability, access and everyday use of ICT, such as, the use of economic resources generated by the school, the incorporation of students' and teachers' own devices, the subcontracting of Internet connectivity, and knowledge sharing practices among teachers.

Keywords: *ICT; marginality; elementary school; digital education; rural school.*

INTRODUCTION

The case study for this article stems from a larger research project that analyses changes in teaching and learning practices, as a consequence of incorporating information and communication technologies (ICT), in one rural and two urban elementary schools in Lerma, State of Mexico. Located in central Mexico, Lerma is a municipality of rural and semi-urban towns listed on low and very low marginality indexes (Secretaría de Desarrollo Social 2013).

This article will focus on the rural school, which has received equipment, without funding, through several national digital inclusion programmes from 1997 to 2015. None of these programmes were active during the school year during which this research took place (October 2016 to July 2017). Despite greater socioeconomic struggles and marginality than urban schools, this particular rural school community used ICT on a regular basis, which is uncommon in Mexican rural schools where infrastructure, devices, and connectivity are often unavailable. The question that guides this paper is how the rural school community keeps available, accessible, and in daily use, digital devices and connectivity despite their marginality conditions. In order to answer this general question, this article aims to identify how this rural school community (principal, teachers, students, and parents) has developed strategies and translated digital inclusion programmes into local models of availability and access that support regular ICT use.

Rural schools in Mexico

In Mexico, rural public elementary schools are located in areas with populations below 2,500 where marginality is linked to geographical location. Those who live in scattered and isolated populations suffer the highest levels of social abandonment. Thus, the most dispersed and isolated rural communities suffer from high to very high levels of marginalization. Public schools often reflect these levels of marginalization. According to Schmelkes (2005), rural schools look after smaller student populations than urban schools, have poor infrastructure and furniture and tend to have limited books and learning material. Rural principals often double as teachers despite having less teaching experience while a greater percentage of rural school students live under precarious health and nutrition conditions (Schmelkes 2005). These factors influence the difference in quality between rural and urban schools. For example, in comparison to middle-class urban schools, sixth-grade learning outcomes in rural areas have been found to be comparable to fourth-grade level outcomes or lower (Schmelkes 2005).

The rural school in this research is located in a town classified within the low marginality[1] bracket and matches some of the previously mentioned characteristics. There are 220 students enrolled at this school, which has only six classrooms (one for each grade level), and staff includes one principal, one vice principal, six teachers and a janitor.[2] The school does not have a library and didactic materials are reduced to free government-provided textbooks. However, this school has computers installed in a computer lab, as well as computers, projectors, printers and Internet connectivity in all classrooms. Therefore, teachers and students use ICT for teaching and learning purposes on a daily basis.

CONCEPTUAL APPROACHES

Critical Approach to Digital Inclusion Policies

Latin America is one of the most active regions in the world in terms of integration of digital technology into educational systems. In recent years, many countries in Latin America have implemented digital inclusion policies mainly through the 1 to 1 model (UNESCO-IIPE 2014). In Mexico, seven digital inclusion programmes were implemented between 1997 and 2018 at the elementary school level. These programmes, which were designed and implemented on a national scale by the Ministry of Public Education have had varying availability models in terms of how they operated and in their pedagogical proposals. Meanwhile, the official documents that outlined these programmes concurred with Severin and Capota's (2011) perspective on the ideas that drive ICT policies in education systems in Latin America and on their positive impacts on the economy, social welfare, and education.

For example, between 2002 and 2007 the *Enciclomedia* programme equipped fifth and sixth-grade public elementary school classrooms with a computer, printer, projector and electronic whiteboard. The programme aimed to:

> Improve the quality of public elementary school education on a national level and impact the educational and learning process, through experimentation and interaction with educational content incorporated into *Enciclomedia*, a tool designed to support a way of

[1] 'Low marginality' indicates that 14.19% of the population aged 15 or over has not completed elementary education, that 7.01% don't have access to sanitary services such as WCs, that 25.19% of the population don't own a refrigerator (Secretaría de Desarrollo Social 2013).

[2] In comparison, the largest urban school where the full investigation was conducted, had 1100 students enrolled, with a staff of 40 teachers.

> teaching that stimulates new pedagogical practices in the classroom when learning the subject matter and contents of textbooks (SEP 2004, p.10).

These ideas concur with Selwyn's (2015) observation on the discourse of governmental and multilateral agencies, which assume that the use of technology in schools systems actively drives learning.

In Mexico, digital inclusion policies have taken on a technocentric approach, usually aimed solely at providing schools or students with devices while neglecting aspects that are critical to daily operation of these devices, such as training and professional development for teachers, technical support, dated school infrastructure, insufficient Internet coverage (Díaz Barriga 2014), updating pedagogical objectives (Severín & Capota 2011), insufficient curricular integration and the pragmatic predominance of ICT (Díaz Barriga 2010, p.138).

Latin American critical studies on digital inclusion policies in public schools are of particular interest to this research (Dussel 2018, 2014; González 2008, 2014). These approaches highlight the unidirectional character of ICT insertion and digital inclusion policies on two levels. The first level analyses these policies from the core to the periphery of the system, for example, through recommendations issued by international organizations that are applied in the developing world, including Latin America (González 2008). The second is a top-down approach in which the general population of developing countries are not taken into consideration by their governments when designing programmes aimed at benefitting them (Dussel 2014; González 2008).

The vertical design and implementation of ICT insertion programmes ignores the characteristics, needs, and particular interests of school communities. Nevertheless, as pointed out by Dussel (2014), every school has taken a different approach in terms of aims and timing when incorporating technology to their practice. Thus, critical studies on digital inclusion highlight particular or local ways in which technology is incorporated into concrete practices that respond to ‘particular social relations, traditions and institutional structures’ (Dussel 2014, p.40). Through this approach we can identify how communities use technology and establish whether or not their learning process improves within their actual living conditions (Dussel 2014) or if they take routes other than those provided in digital inclusion policies. This approach proposes to study digital practices according to their situated character, their relationship with the characteristics of the community, the context, the interests, and practices in which digital technologies are used.

While analysing how school communities use ICT, we identified translations of digital inclusion policies and problem-solving strategies regarding the use of ICT in classrooms and school practices. Translation is understood as interpretations made by actors in order to adapt policy guidelines to specific local contexts (Dussel 2014). These translations are expressed in community discourse and actions surrounding the use of ICT and when communities use official insertion programmes as a reference before adapting them to their particular needs. This concept allowed us to trace the ways in which the school community adapted the symbolic and material resources of public policies to developing a model for use of technologies in the classroom.

Access to Digital Technologies from Literacy Approach

In the last two decades, digital inclusion policies in Mexican elementary schools have been based on what Warschauer (2002, 2003) calls the "device model" and the "conduit model". Digital inclusion programmes based on the device model consider that the physical presence of digital devices is sufficient for people to use them. The conduits model considers that schools must also have Internet connectivity for people to fully benefit from ICT (Warschauer 2002, 2003). However, there is enough evidence to state that both the device model and the conduit model are insufficient when it comes to understanding what allows people to truly benefit from digital technologies (Chong

2011; Díaz Barriga 2014; Dussel 2018; González 2014; Kalman & Hernández 2018; Kalman & Rendón 2014; OECD 2015; Selwyn 2011; Warschauer 2003). In this context, Warschauer (2002, 2003) proposed a third model, which is based on sociocultural theories of access to literacy.

Warschauer follows in the footsteps of authors such as Street (1995) and Gee (1996), for whom literacy is a matter of culture, power and politics, as opposed to simply developing cognitive abilities (Warschauer 2002). This argument is central to a literacy as a social practice perspective (Street 2016, 2013), which implies a rejection of the dominant vision of literacy as a neutral technical skill, and a shift towards a conceptualization of literacy as "an ideological practice, implicated in power relations and embedded in specific cultural meanings and practices" (Street 1995, p. 1). Kalman (2009) also notes that the availability of literacy resources is a necessary condition, but does not provide sufficient access to literacy practices. For example, an environment rich in text (with books, newspapers, libraries) facilitates access to reading practices (Warschauer 2003); however, the discourses and ideology that surround literacy practices, the community and institutional structures that support participation in reading and writing practices and the relationships with other people who model and promote ways of reading and writing specific textual materials, are also crucial.

Grounded on this approach, Warschauer indicates that:

> If literacy is understood as a set of social practices rather than as a narrow cognitive skill, this has several important consequences for thinking about the acquisition of literacy, and important parallels with the acquisition of access to ICT. Literacy acquisition, like access to ICT, requires a variety of resources. These include physical artefacts (books, magazines, newspapers, journals, computers); relevant content transmitted via those artefacts; appropriate user skills, knowledge, and attitude; and the right kinds of community and social support (Warschauer 2003, pp.43–44).

Warschauer (2003) states that access to digital technology is constructed from the articulation of different elements. First, the physical presence of devices, which includes the number of computers, the presence of hardware and software, and the functionality of the equipment in the school. Second, the necessary conduits for connectivity, such as electrical infrastructure and internet connectivity. Third, having digital content that is related to the software installed on devices and websites that can be viewed on the Internet. Fourth, community knowledge, attitudes, and values on the role of ICT, as a part of specific social practices. Fifth, social and institutional structure, or personal and professional relationships that promote specific ways of participating in practices using ICT (Warschauer 2003); and finally, the rules and structure that outline participation in ICT practices within a community or institution. This approach allows us to understand that the strategies that the school community has developed to maintain the availability and use of ICT are the result of the articulation of different sociocultural elements framed in the local context of the community.

METHODOLOGY

The case study analysed in this article took place at a full-time elementary rural school (8:00 a.m. to 3:00 p.m.), with a population of 220 students divided into six groups, one for each grade.[3] Teaching staff at the school consists of six teachers, a principal and a vice-principal.

Data collection and construction for this fieldwork followed qualitative ethnographic methods (Maxwell 1996). During the 2016-2017 school year, researchers conducted semi-structured

[3] In Mexico, elementary school is divided into six school grades. Officially, children who attend elementary school must be between 6 and 12 years old.

interviews (Hoepfl 1997) with school authorities, teachers, students, and parents; observed lessons; studied digitized documents considered to be evidence of the school's digital practices and observed demonstrations of the uses of digital devices (Hernández 2015) in which students participated. The regular presence of researchers in the school allowed data collection based on observations and informal conversations about the daily activities of different members of the school community. This data was recorded in field notes and preliminary reports (Loubere 2017).

Specifically, according to the purpose of this paper, data analysis is based on the following sources:

- A midyear interview with the school principal and several informal conversations, which were recorded in the fieldnotes.
- Two individual interviews with the teachers from each grade level, at either end of the school year.
- Informal observations of classroom sessions and school activities during the year school, recorded in the fieldnotes.

However, our data interpretations are also guided by the fieldwork carried out with the students of the school, through interviews and demonstration of student's uses of digital devices.

Our fieldwork was based on the categories of availability, access and uses of ICT as described by Warshauer (2002, 2003) and Kalman (2009). Availability is described in terms of the physical presence of devices, which includes digital content and software, and Internet connectivity for teachers and students at school. Access is described in terms of school members' and community knowledge, attitudes and values, and the institutional and social relationships that surround and enable teachers' and students' use of digital technologies, including formal and informal rules in schools. ICT uses are described in terms of what teachers and students do with technology in school. Also, through interviews, teachers' early ICT experiences were identified, the history of digital inclusion programmes implemented at the school was reconstructed and school community opinions and their general sentiment on the role of ICT in their school were noted.

Our first data analysis strategy consisted of transcribing interviews, class observations and demonstrations. Then, transcriptions were coded with ATLAS.ti, a qualitative analysis software. The first coding was divided, deductively, into three initial categories: availability, access and ICT uses. We created a second coding using inductive pattern codes (Miles, Huberman & Saldaña, 2014; West 2019) to sort through information obtained from the transcripts.

Our second analysis strategy consisted of identifying how the school community builds local models for ICT availability and developed local strategies to support access and the daily use of ICT and the Internet in the context of rural marginality conditions. This analysis was grounded on a critical perspective of ICT insertion policies in Latin America (Dussel 2014; González 2014), and the Warschauer's approach (2003) to access to digital technologies.

On one hand, to analyse how the school translated and implemented public ICT policies, we identified how government programmes have changed and remained in the models built by the school community, and the views of the principal and teachers on their decisions that led to developing a local model. On the other hand, the analysis considered how the principal, teachers and parents supported and improved their local ICT model, through some strategies, to suit their context, aims, values and views on the role of ICT in education.

RESULTS

Local models for availability of ICT

Availability of digital technologies and local models

In the rural locality where the school is located, the availability of digital devices and Internet connection is poorly distributed among the population. According to teachers, only a few of their students had computers and Internet connectivity at home. However, teachers stated that most of their students were experienced using mobile phones to play video games, navigate the Internet, and use social networking sites. In this regard, mobile phones and cybercafés in the community are an important resource, which enables students to search the Internet and do homework on the computer.

On the other hand, all teachers have a desktop or laptop computer at home and can connect to the Internet at least through their cell phone. In the community in which the school is located, Internet connectivity is only available through mobile phones or satellite connections, which is more expensive than the broadband connections offered by phone companies in urban areas. Thus, only teachers who lived in urbanized communities had broadband connections at home.

Inside the rural school, the notion of availability of digital devices is similar to that of two other past models that were implemented as a result of digital inclusion policies: the computer lab model, and the computer-in the-classroom model (Lugo & Schurmann 2012). In the computer lab model, the rural school designated a specific classroom where 45 computers equipped with Office suite but no Internet connection were made available. All computers were recycled from previous digital inclusion programmes. In the following, in order to focus the analysis, only the computer-in-the-classroom model will be described.

The computer-in-the-classroom model had been developed by the school community over 6 years. Year after year, the school community purchased the necessary devices to equip each classroom with a desktop computer with Office suite software, a projector, a printer, and an Internet connection. As discussed below, the school community developed different strategies in order to purchase the devices.

Rules for use of the computer-in-the-classroom model are flexible. The principal's only recommendation is that every teacher takes care of the devices installed in their classroom. Therefore, each teacher establishes their own rules with their students regarding the use of the computer, the projector, the printer and the Internet.

The rural school benefited from a federal Internet availability programme known as "Connected Mexico" ("México Conectado"). However, connectivity in school was deficient during this programme. Therefore, in an effort to privilege administrative activities in school, the service was made available exclusively in principals' offices. So, in order to provide Internet connectivity for the entire school community, school authorities acquired Internet access through a private provider with resources generated by the school, through the cafeteria, and with voluntary contributions from parents. This Internet connection was used to wire-connect each classroom and the school office.

According to our observations and the teachers' and students' testimonies, the computer-in-the-classroom model is used in two general ways. First, it serves as a resource to support lessons based on textbooks, for example, to watch YouTube videos previously selected by the teachers, to introduce or to illustrate curricular content, or to project educational software in order to help students solve some activities individually or collectively. Second, it is used as a resource to develop digital skills. Most of the teachers agreed that the availability of devices like computers,

printer or projector in the classroom represents an opportunity for many students to use a digital tool or to navigate the web for the first time. Most of the teachers indicated that they invest time in the class to show and allow some uses of the computer and the Internet to their students. In both cases, teachers and students concur with the idea that the use of digital devices plays an essential role in keep students' attention and motivation.

The computer-in-the-classroom model as a translation of digital inclusion policies.

The devices required for the computer-in-the-classroom model and the formal and informal rules on how to use them, have been the result of agreements reached between school authorities, teachers and parents, driven by the principal's interest in enabling the use digital technologies for academic activities.

The rural school has allowed the implementation of several digital inclusion programmes. The federal digital inclusion programme known as *Enciclomedia*, implemented between 2002 and 2007 is the most important reference for the computer-in-the-classroom model. However, the school community has translated some of *Enciclomedia*'s characteristics to suit their current interests and possibilities.

Originally, *Enciclomedia* was implemented in 5th and 6th-grade classrooms across public elementary schools nationwide. Classrooms were equipped with a computer, a projector, a printer and an electronic whiteboard, but not with Internet connectivity. *Enciclomedia*'s software included digitized textbooks, the content of Microsoft's Encarta encyclopedia and *ad hoc* educational software developed to support curricular textbook content and a number of educational activities suggested in the texbooks.

Some rural school teachers agreed that *Enciclomedia* made their work easier because they were able to use the exercises, activities and multimedia resources that had been included in the software, and had useful devices available, such as the printer. For example, a fourth-grade teacher, said:

> *The nice thing about Enciclomedia is that we were given a printer and I could print the materials for the children: a map, a diagram, anything. So I didn't need to ask students to bring the map the next day, because some students would not bring it. With Enciclomedia I used to give the students materials myself, it was a great feature.*

Also, according to teachers, *Enciclomedia* allowed students to stay focused and encouraged participation in class. These were some of the reasons that led the school principal to promote the computer in the classroom model:

> *I had the chance to work with Enciclomedia, and I saw its importance, because, and I'll say this again, Enciclomedia activities helped me a lot, supported me, made work easier; so when I became responsible for this school and part of the Full-Time Program, the first thing I thought of was to find a projector.*

The principal sees himself as an active teacher, and *Enciclomedia* aided his work. When he was promoted to school principal, he wanted teachers and students to use similar devices.

For some teachers, one of the *Enciclomedia* programme's greatest flaws was that it had only been implemented in 5th and 6th grade. Thus, the school community made an important translation by installing devices in all classrooms. As the principal said,

> *Nowadays, thanks to the Full Time Schools programme, the priority is not only for fifth and sixth-grade classrooms to have projectors and computers, and even though the whiteboards are not interactive, we want all students to do similar activities to those offered by the Enciclomedia program. The impact has been very positive.*

According to the previous comment, another translation made by the school community was the decision not to install smart whiteboards, mainly due to lack of financial resources. Instead, classrooms were equipped with whiteboards that doubled as projection screens.

In the absence of interactive software like that of *Enciclomedia*, the school community saw the importance of reinforcing this model with an Internet connection. This is another important adaptation of the programme. However, using the Internet, teachers were able to find activities similar to those once found in *Enciclomedia*. For example, they can introduce or review curricular content through videos or download and project electronic textbooks to teach student to read and write or project interactive educational software from web sites. On this matter, a first-grade teacher stated:

> *I downloaded all the textbooks, so when I work with the language textbook, I take out my computer, connect it, turn on the projector and project the page we are working on for students to see. This way, children who have not acquired literacy skills can see what we are working on. I point to the words and we all read together. Also, we all answer together: they answer, I write on the whiteboard and those who still do not know how to write, can copy what we are doing.*

For teachers, the most useful *Enciclomedia* feature was that it provided content and resources that made their work easier. Therefore, the most important translation from *Enciclomedia* to the local computer in the classroom model was the inclusion of an Internet connection because it allowed them to support their model with content.

Local Strategies for Availability and Access to ICT

The school community has developed local strategies to maintain availability and access to digital technologies in the school. Availability and access to digital technologies depend on the principal, teacher, and parent initiatives to identify different resources. Based on data analysis, these strategies are: a) the use of economic resources generated by the school, b) the use of students' and teachers' own resources and digital devices for school activities, c) the subcontracting of Internet connectivity, and d) knowledge sharing practices among teachers.

The use of economic resources generated by the school

In 2011, the school joined the Full-Time Schools Program ("Programa de Escuelas de Tiempo Completo), which supports school with approximately $5,300.00 USD per year to invest in improving new facilities and classrooms, providing teacher training and purchasing teaching materials and technological equipment. Using these resources, the school community has developed the computer in the classroom model gradually over a period of six years. Following the purchase of a projector, the school has acquired other devices throughout the years. An Internet service provider was also hired two months before the end of the 2016-2017 school year.

Although funding for this programme has allowed the school community to purchase computer equipment for classrooms, the school community has sought other finance strategies to keep the equipment running and updated, and to maintain an Internet connection. The principal stated that:

> [regarding installed computers] *we also give them maintenance with school resources, because the Full-Time Schools Program funding does not cover maintenance […] Some resources come from the school cafeteria, so together with the school committee, we adjust our budget to include maintenance and for whatever else is needed here...*

The Full-Time Schools Program does not cover any computer maintenance service fees or Internet service provider costs. As a result, the school community decided to allocate a percentage of the resources obtained through parent donations at the beginning of the year, and from revenue obtained through the small school cafeteria to these purposes. Decisions about how these resources are used are agreed upon by consensus from school authorities, teachers and parents, and are bound by a legally established association.

The use of students' and teachers' own resources and digital devices for school activities

Before the Internet service was installed at the school, some teachers used data from their mobile phones for activities that required using the Internet in the classroom. For example, a second-grade teacher, stated the following:

> Researcher I: *Is there internet at school?*
> Teacher: *No, this is something that ... that limits us because we have all the equipment, but often ... for example, I have to use my data to...*
> Researcher: *To download different things from the internet*.
> Teacher: *Yes, download information and give it to the students ... or even among other teachers ... we ask, hey, do you have any data? ...*

The Internet is an important part of teaching activities; therefore, although the school did not have connectivity, some teachers used the Internet service on their mobile phones to download materials such as videos, music, educational software and other items for use in the classroom.

Personal resources are also used to purchase printing supplies for classrooms. Teachers mainly print exercise sheets for students to solve in class or at home. Funds for ink and paper are donated by parents at the start of the school year as part of an agreement that allocates resources exclusively for this purpose. These funds are managed by a parent committee per each classroom that is also responsible for purchasing supplies at the start of the year and throughout the year as required.

The school community is unable to use economic resources for maintaining and repairing equipment when necessary, so some teachers voluntarily donate part of their time and knowledge to keep the computers running. This task has been undertaken by a male fourth grade teacher, and the school vice-principal, both of whom are known by their colleagues as 'computer-literate'. They support the school community by formatting equipment, connecting wires, dealing with computer viruses or installing programs whenever necessary, even when these tasks are not featured in their job description.

The subcontracting of Internet connectivity

To have the Internet available for academic activities, the principal and parents agreed to subcontracting a satellite Internet service through a cybercafé located next to the school. This was the best possible option for this rural community to have connectivity in an area where Internet coverage is only available through satellite service which is more expensive than broadband Internet.

Some cybercafés hire this service and then subcontract it to third parties.[4] For the rural school, this subcontracting arrangement implies lower connection speeds because it is shared for all school computers. This influenced the way in which the school community decided to distribute the Internet service throughout their facilities. For example, months before hiring the service, the principal speculated on how to bring a connection to the school:

> Principal: *[...] this is the proposal to pay an internet service with resources obtained through the school cafeteria. I do not know how the committee will do it, but people are less reluctant and more participative. We have considered installing the internet to use it, alternatively, to download some activities and be more functional, taking turns to use it because we know that when we use many computers it gets slower […]. We have already been over this and we will make a schedule. We don't want it installed here (in the computer lab), because there are thirty or so machines and we need high band width, but no, we don't have enough resources, so what we are going to do is install it in the classrooms and here in the office; establish a schedule for the classrooms.*

The principal indicated that the Internet service is paid using financial resources obtained through the school cafeteria. He aims to ensure that the Internet is available when teachers need it. One consideration regarding Internet connection functionality was the number of computers that would be connected and the schedules in which they would operate. The principal was opposed to simultaneously connecting many of the computers in the lab because of the Internet connection. From his perspective, the best places for an Internet connection are the classrooms because only six computers are connected at a time. He also considered regulating the hours in which teachers would use the Internet to avoid the overlapping use. However, once the service was installed in the classrooms teachers used it at will and did not report any problems, thus eliminating the need for a schedule.

Knowledge sharing practices among teachers

As previously stated, from Warschauer's perspective (2002, 2003), access to digital technologies implies not only the availability of devices, but the knowledge, values, institutional arrangements and social relationships that surround and make specific uses of ICT possible. In the rural school, teachers' knowledge of ICT varies widely. Some teachers show fluency in the use of digital devices, but others are unsure of the use of ICT for teaching purposes. In the first category are teachers like a male aged 34, who teaches fourth grade. He studied Math in a state college and has worked as teacher for seven years. As he mentions, he usually attends online, and offline ICT courses provided by government agencies:

> Teacher A*: In 2014 I completed a "digital ideas" course and now I am studying other online courses. I also just finished two courses in collaborative projects. As part of these courses, instructors send us plenty of interactive, history, English-learning, mathematics and language software [...] We have an online forum, and through that forum, instructors send us activities and we have to send them evidence, with photos and PDF files, of what we are doing with our students in the classroom.*

[4] Satellite internet service requires a payment of $5,560 MXN ($233 USD) and monthly charge of $929 MXN ($34 USD) for a 1.5 megabyte speed service (http://stargomexico.com/index.php/hogar). In contrast, broadband internet service requires an initial installation payment of $1,310 MXN ($55 USD) and a monthly rent of $435.00 MXN ($18 USD) for a service of 20 megabyte speed service (https://telmex.com/web/hogar /internet connection).

On the other hand, there are teachers like another male, aged 52, who teaches third grade and is not at ease using computers in the classroom because he feels he lacks sufficient knowledge and skills. As he established in an interview:

> Interviewer: *When do you use the computer to teach in the classroom? Do you use it often?*
>
> Teacher E*: No, I do not use it often. But I've realized that you need to use it frequently to motivate students. But I feel that I need to know more about technology.*
> *[...]*
> Interviewer: *Do you feel that the use of technology is complicated?*
>
> Teacher E: *Well, yes. I am afraid to use the computer. When I went to the Teaching School, teachers never taught us that. We had typewriters, and we were reluctant to use computers because we didn't need them. But now, when we need the computer, we have to try to use it [...] I am not very comfortable with technology.*

The unequal distribution of knowledge of ICT uses among teachers is perpetuated by to the lack of permanent training programmes in the workplace. This lack of training programmes has been a constant feature in the implementation of public digital inclusion policies in México (Kalman & Rendón 2014). Teachers' knowledge of the use of ICT depends entirely on experiences during their professional training, as well as personal interest and the possibility of attending courses offered by public agencies or private companies.

In the absence of training programmes in the workplace, social relationships play an important role in teachers' encouraging each other to use the computers. When the rural school´s teachers need to solve technical or pedagogical issues about digital devices, they usually ask the two male teachers for assistance. For example, a female fifth-grade teacher said:

> *When I have any problems, I support myself from my colleagues, [Teacher A or E]. Once, [Teacher A] help me to learn how to use software to design slides, he said that it is the easiest and most dynamic software to make slides, I don´t remember what the software is called, it starts with z. […] Once, [Teacher E], when I was doing my planning using Excel I needed another cell, so he sees the screen, and he said to me "no teacher, it is easier in this way: look, go to this window, open it, find" and he is the one who, if at the moment we have any doubt he supports us.*

In Mexican elementary schools, classes are suspended once a month so that teachers from each school can meet to discuss and propose solutions to school problems, as well as develop continuous improvement projects. Teacher A's comments that it is in that moment he has the opportunity to talk with colleagues and share experiences on the use of educational software, teaching strategies, or to support his colleagues in any questions they may have.

Given the unequal distribution of knowledge, confidence in professional relationships between expert and non-expert teachers is important when learning to use technology and sharing relevant software, web sites, or social networking sites for educational purposes. The relationship between teachers and students is also important. Many teachers acknowledged that in some cases, students know more about specific uses of technology than themselves. In those cases, teachers are said to be open to receive help from students.

Moreover, teachers find that ICT knowledge is unequally distributed among students in their school. Some are able to operate a computer; navigate the Internet on mobile phones; or use software like Word, PowerPoint, Excel. Others are inexperienced with devices and software. Thus, some

students first learned to use digital devices at rural school. In the words of a female teacher who teaches second grade:

> *In fact, I am teaching them to use basic software such as Word or Paint, but especially Word because it will be useful to them forever. In first grade they did not know anything about the computer and now they are using the keyboard a little bit more. Once I even asked the students, as a homework assignment, to draw the keyboard on cardboard so they could practice, because most of them do not have a computer at home. There are very few who do own a computer.*

Despite the unequal distribution of knowledge in the use of ICT, all teachers use the resources available in their school at least once a day, especially if their devices belong to the computer-in-the-classroom model. In the teaching community, ICT are seen as necessary to promote learning while enabling teaching as well.

CONCLUSIONS

The data show that the rural school community developed strategies and local models of ICT use to maintain the availability, access, and regular use of ICT in classrooms. Local availability models have direct references to official ICT insertion programmes, so we consider that local models are shaped by translations of official models implemented years before. On the other hand, developing local strategies that allow the functioning of the ICT availability models, the school community articulates several economic and socio-cultural elements that facilitate access and constant use of technologies in the school.

The local models for availability of digital technology that the school community built are shaped, in part, by their translations (Dussel 2014) of previous official ICT insertion programmes. As the principal and a number of teachers mentioned, the computer-in-the-classroom model is based on their *Enciclomedia* experience. They admit that when it was implemented in their school, this programme helped keep students engaged during lessons and made their job easier because it offered multimedia teaching resources. The school community adapted the Enciclomedia programme and added connectivity to search for educational resources on the web and use them in the classroom.

The school community has developed a range of ICT availability and access strategies. These strategies resulted from the intersection of the school community's interest, particularly the principal's interest, in promoting the use of digital technologies for teaching and learning; the school's and the surrounding community's socioeconomic conditions, which are characterized by marginality; the school's institutional structure, which includes its rural school condition, its reduced size in terms of the number of teachers and students, and the power to decide on the use of specific financial resources with certain autonomy. The freedom to use financial resources provided as part of the Full-Time Schools programme to suit the school's needs and interests has been highly significant to the community and the principal. Programme regulations allow the school community to decide, within a framework of possibilities, what to do with the available funds. The possibility of deciding on the use of economic resources has been influential in consolidating the computer in the classroom as a relevant model for the school community.

Given the conditions of marginality in the school and among the student population, the way the school has chosen to invest part of their financial resources in technological equipment and connectivity, despite the elevated cost of Internet services in the context of the community, is remarkable. A possible explanation is that in conditions of marginality such as those found in this community, the availability of digital technology and connectivity at school, replaces in a practical

way (González 2008), the lack of accessible technological infrastructure and cultural services such as public libraries or community centres.

By subcontracting an Internet service, this school community has found an effective response to connectivity shortcomings in the official programme and to the conditions under which the telecommunication industry operates in rural areas of Mexico. On the other hand, the use of economic resources generated by the school and parents' voluntary contributions to buy computer equipment and pay for an Internet service demonstrates the role of social relations when establishing local agreements that eventually allow the consolidation of a model of availability of technology that can be relevant to community contexts. It also represents an example of practices that should be analysed in order to transform the verticality with which digital inclusion has traditionally been designed and implemented in schools (Dussel 2014), and is a case for horizontal designs that take peripheral practices in the use of ICT into account (González 2008).

The case of the rural school shows that access to ICT goes beyond the mere availability of devices and connectivity. Literacy perspectives on ICT access (Kalman & Hernández 2018; Tripp & Herr-Stephenson 2009; Warschauer 2003), have been useful when analysing the articulation of elements that enable school communities to use ICT in accordance with its interests, values, and socioeconomic context. From a literacy perspective, key to understanding what makes ICT access possible are the social practices and the constructed meanings in which technology is used. The case of the rural school shows that, in each classroom, teachers do things with technology every day. This includes teachers who consider themselves to be digitally illiterate, and it is possible because teachers are certain that technology is a necessary tool for learning and motivation, especially in a context of marginality where students often lack ICT and cultural resources at home and in the community.

Theorists and policy makers must pay more attention to local ICT availability and access strategies, which will provide greater evidence to support ICT access proposals in collaboration with school communities, or as González (2014, 2008) points out: from the periphery to the centre and from the bottom to the top. Finally, questions remain about the pedagogical sense of ICTs when availability and access models are developed by the school community itself, without there being any direct orientation on behalf of a governmental ICT insertion or digital inclusion programme.

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