Beyond common explanations: Incorporating digital technology and culture into classrooms in México.

Judy Kalman
Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional, México.

Online Publication Date: 15 November, 2013

To cite this Article: Beyond common explanations: Incorporating digital technology and culture into classrooms in Mexico. Digital Culture & Education, 5:2, 98-118.


PLEASE SCROLL DOWN FOR ARTICLE
Beyond common explanations: Incorporating digital technology and culture into classrooms in México.

Judy Kalman

Abstract

More and more teachers in Mexico are expected to use digital technologies in their classrooms. However, little guidance is provided for them to transition from pencil and paper practices to the screen. This paper argues that teachers' use of digital technology (or lack thereof) is a social construction where multiple processes—the realities of their workplace, their understanding of digital technologies and the Internet, and their longstanding beliefs about teaching and learning—coincide to shape their classroom practices. The author builds her analysis of three teachers learning to use technology in their classrooms in Mexico City on socio cultural theory, most notably notions concerning social interaction and practice. She illustrates teachers' heterogeneous responses to this new professional demand. She concludes that specific classroom uses of technology are the result of teachers' particular articulation of the multiple relationships and obstacles encountered in their workplace.

Keywords: Digital literacy, technology, practice, teaching, Mexico, secondary school, socio cultural theory.

Increasingly, educational policy makers endorse the use of digital technology in schools, arguing that computers and the Internet are now part of contemporary life, and that giving all students access to technology is a matter of equity and fairness. In the 2012 New Media Consortium Horizons report, the authors note that: “Increasingly, technology skills are critical to success in almost every arena, and those who are more facile with technology will advance while those without access or skills will not” (Johnson et al. 2012, p. 8).

This ubiquitous view of technology (Kuznetsov & Dahman 2008) is expressed in official documents, curricula, and teaching standards for using technology. In 2009, the Secretaría de Educación Pública (SEP, the Federal education authorities in México) stated that:

In a globalised world, the use of Information and Communication Technology (ICT) has become a requirement in the workplace and is necessary for contact with other societies. Schools cannot stand on the side lines of these demands; they must take on increasingly complex and diversified tasks. Teachers need to shape their work accordingly and meet the needs of the times and the demands of modern society, which means developing new competencies (Martínez, 2009, p. 7).

It is assumed teachers will somehow naturally make the transition into using these tools and in fact, new curricular guidelines derived from international policy puts teachers under a great deal of pressure to do so. However, research has shown otherwise: for more than a decade, studies have presented evidence that both quantifies and qualifies how much equipment is now in schools and how little it is used (Bigum & Lankshear 1997; Cuban 2000; Guerrero 2011; Jara 2008; McFarlane 2003).

Standard reasons for why teachers fail to use technology posit that teachers do not receive sufficient training to learn needed computer skills, schools may not provide the appropriate software for specific subject matters or that some teachers find learning to use the computer too overwhelming (Kalman and Guerrero, 2013). This paper seeks to go beyond these common explanations for understanding why teachers use (or do not
Beyond common explanations

use) technology in their classrooms (Acosta 2012; Leu et al. 1998; Martínez, 2009) and construct a more nuanced view of the challenges they face.

The central argument is that teachers’ use of digital technology (or lack thereof) is a social construction where multiple processes—the realities of their workplace, their understanding of digital technologies and the Internet, and their long standing beliefs about teaching and learning—coincide to shape their classroom practices. A first premise underlying this article is that teachers articulate the diversity of relationships and processes that come into play in their specific work contexts in their attempts to incorporate technology into their classrooms. A second one is that as a result of their specific articulations, teachers’ trajectories are highly diverse, even when they face similar situations. Because this paper analyses teachers in Mexico, some specificities relating to that context are presented to the reader.

This article has five sections: First, a discussion of some of the tenets of social cultural theory and the notion of social practice. The second section describes the work the Laboratorio de Educación, Tecnología y Sociedad (LETS) does with teachers in México City, its premises, and goals. The third section presents empirical evidence through sketches of three teachers working in their classrooms as a way to problematise—in productive ways—what it means to use technology in an educational setting. The fourth section presents a discussion of the teachers’ work and the final one outlines some closing remarks.

Using technology in the classroom from a social practice perspective

In this paper I explore the process of three teachers learning to use technology in their classrooms in México City. The analysis builds on socio cultural theory, most notably notions concerning social interaction and practice (Lave & Wenger 1991). According to Lave (2011) socio cultural theory is a theory of social practice and as such, different types of relationships between the participants, institutional arrangements, and the distribution of power are central to understanding what happens in the classroom and why (Barton & Hamilton 1998; Street 1995).

In the 1980s, Scribner and Cole (1981) posited that all social practice implies the use of a technology, skill, and social knowledge relevant to that practice. Barton and Hamilton (1998) note that practices are not observable because they include aspects related to people’s beliefs, ideas, and histories as well as visible actions. However, people’s participation in practice becomes visible in specific events where they bring operative knowledge, social knowledge, and an ethos (Lankshear & Knobel, 2011) about their participation. Their ethos includes their beliefs, their values, and priorities. For this article, such an approach allows the researcher to focus on the diverse ways in which teachers use digital technologies and to pay attention to how they relate to the diverse factors that impact their incorporation of technology into their classrooms.

At LETS, a research group in the Departamento de Investigaciones Educativas (DIE) at the Centro de Investigación y Estudios Avanzados in México City (CINVESTAV), we consider information, communication, and design technologies (ICD-T hereafter) a powerful social tool, useful for establishing and maintaining social relationships (Dyson 1996), conveying multimodal meanings (Kress 2003), and representing knowledge. Current technology integrates multiple tools and expressive options that range from basic editorial design such as fonts, distribution of text on a page, and the integration of image and writing, to complex and sophisticated dynamic representations, hypertexts, multimodal compositions, and animations. Furthermore, through the internet, digital culture is created and maintained through online interactions in real time, asynchronic communication, and the development of virtual communities where participation and
learning are based on the possibility to consult and be consulted, contribute to a common cause, receive and give copious feedback, develop situated expertise, and establish accreditation from virtual communities (Gee 2003, 2006). In this context, the ethos of collaboration, distributed knowledge (the idea that everyone has something to offer), and participation in collective enterprises are an integral part of digital culture (Jenkins 2006; Lankshear & Knobel 2011). Vital questions arise in our work at LETS regarding how teachers integrate the pedagogical, the operational, institutional aspects ICD-T, and the ethos of digital culture in their teaching. We are concerned with understanding what they do and why they do it (Geertz 1983), and what experiences, knowledge, and know-how might contribute to creating an educational context that goes beyond doing what Lankshear and Knobel (2011, p. 214) refer to as “business as usual” teaching.

De Certeau (1988 p. xi) notes that historically social analysis created the category of the individual, “the basis of which groups are supposed to be formed.” He goes on to note that social analysis has shown, conversely, that individuals are the locus in which multiple relationships, often contradictory and incoherent, interact. Teachers’ exploration and use of technology can be seen as an “errant trajectory” (De Certeau 1988, p. xviii) where they turn to their own means and resources to articulate heterogeneous elements such as official discourse, institutional arrangements, their professional background, deeply rooted teaching traditions, suggestions that arise from their participation in the LETS’ meetings, and their beliefs about teaching and learning, among others.

The analysis of three participating teachers’ efforts to understand and use technology centres on their diverse ways of integrating a plurality of social determinations. Muchaly (2012) proposes that in any teaching event multiple tributary factors flow together to create a specific instance of teachers’ work; she points out that the different ways of teaching are an ensemble of processes, histories, knowledge, and know-how. In a similar sense, Gee (in Lankshear & Knobel 2011, p. 44) argues that we are “situated selves”:

which can be understood as meaningful coordinations of human and non-human elements. Besides people themselves, the human elements of coordinations include such things as people’s ways of thinking, acting, feeling, moving, dressing, speaking, gesturing, believing, and valuing, and non-human elements include such things as tools, objects, institutions, networks, places, vehicles, machines, physical spaces, buildings, and so on.

Here the goal is to understand the situatedness of these teachers and their efforts to use the computer and Internet in the classroom. Furthermore, I seek to comprehend how their grasp of information, communication and design technologies (ICD-T) and digital culture are mediated by their fluency in operating the equipment, their interpretation of official discourse and curricular requirements, their beliefs about their students, their pedagogical stance, and their willingness to take certain risks and try new approaches in their teaching. Sutherland et al. (2009, p. 20) note that for teachers to “fully exploit the potential of new technologies in transforming learning, there is much for them to learn. Incorporating ICT frequently challenges well-established ways of teaching and learning. This sometimes involves painful rethinking”.

**Working with teachers**
In LETS we organise work groups with teachers where they collaborate with researchers, graduate and under graduate students, and colleagues. The participating teachers are volunteers and, in most cases, they have heard about our groups from other teachers or through a written invitation we send to their school.

We begin each school year with a one-week intensive workshop we call “Installation Week” where we explore different aspects of digital literacies, culture, and practice. Over the school year this is followed up with five to six work sessions held at the DIE-CINVESTAV campus on a weekday (teachers are given permission to attend by their authorities), along with some visits to classrooms.

At LETS teachers explore what we call “universal tools”, i.e. software that one might find on any computer in a cyber cafe (albeit in different versions), online freeware, and communication options. These options imply no expense for the teachers and are tools that their students will also be able to use. We use these tools for different purposes such as selecting and analysing information, communicating with others, and developing learning activities that include the design of cultural objects such as posters, videos, or animated maps. For this reason, in this paper we use ICD-T (rather than the more common ICT—information and communication technology) as a short hand for technology use.

We often offer teachers technical guides designed by LETS regarding a particular tool, or show them how to find resources online. We also provide search options and opportunities for consulting with colleagues and getting to know a given resource. Teachers are invited to discuss their curriculum and plan learning activities for students that involve both online and offline uses of the computer and other resources. They then take these proposals into the classroom, try them, and report their experiences to the group. We collectively analyse what they found successful, any shortcomings, and ideas related to their teaching.

During the 2012 Installation Week, a group of eighteen language arts, history, and geography teachers, as well as six computer lab resource teachers from public middle schools participated. We developed a sequence around the subject of modern day slavery, a topic that could be of interest to all participating teachers, and proposed they produce an infographic by the end of the week. In each session we used resources such as Google Maps, Google Docs, and Book Markers, among others as a way of modelling them as possible classroom tools. Our sessions included looking for information and different types of resources (videos, maps, testimonials, reports, policies, images, graphs), designing intermediate products to be used in their infographic, organising revision groups, and putting the final project together.

In each session we created contexts for different types of interactions and activities with the intention to help them achieve more than they could if working alone (Gee 2006; Vygotsky 1978). In some cases we organised full group discussions, small group efforts, or one-on-one dialogues using synchronic communication tools. We collectively looked for information, discussed different ways of registering and representing it, and possible options for sharing it. Teachers were given the opportunity to work hands on with the new tools, interact with colleagues, giving and receiving feedback on their work, and collaborating together on common projects. The purpose was to introduce not only technological resources, but to also insert them into pedagogical contexts and model forms of participation and interaction. We sought to show innovative forms of organisation, analyse classroom relationships, and offer viable alternatives to “business as usual” teaching. In the context of schools in Mexico where the tendency is to insert technology into existing school routines, our workshop has two equally important
purposes and priorities: to facilitate the use of digital tools in the classroom while simultaneously creating meaningful learning activities for teachers and their students.

Teaching with technology in Mexican public secondary schools

The teacher portraits presented are part of an on-going study regarding the complexities of using ICD-T in the classroom in Mexican public secondary (years 7-9) schools. As the project is in process, the results presented here are preliminary, we are still holding meetings with the teachers and are visiting their classrooms (through May 2013) as well as processing data (transcribing videos, organising teacher and students products, conducting interviews, charting participation in social media, collecting emails, and creating teacher portfolios).

All of the teachers profiled in this article are graduates of the Escuela Nacional de Maestros (National Teachers’ School in Mexico City) and continued further training for a secondary certificate. Until 1984 teachers in México went from the ninth grade directly into normal school (either the Escuela Nacional de Maestros or one of the schools located in the states). Depending on their age, teachers have a bachelor’s degree in teaching or a normalista degree (a four-year degree in another field).

The teachers discussed here all work in public schools and share similar work conditions and difficulties. Class sizes tend to be large, ranging between 35 and 45 students per group. For the most part, teachers change classrooms from period to period, rather than students circulating. An immediate consequence of such organisation is that any books or materials teachers bring to class have to be packed up and carried with each move. Also, most schools have a computer lab (referred to by the teachers as Red Escolar) where computers are housed. Most labs share a similar use of space; computers are on tables in a horseshoe arrangement with students facing the walls. When there is an overflow of equipment or the room is small, a row of tables may be set up in the middle of the room as well. In some cases, computers are recent laptops with state of the art operating systems, but in many cases the equipment is obsolete. Most of the time there is a combination of new and old technology. Internet connection is generally unreliable and quickly becomes saturated when students are all working at the same time.

Figure 1: Typical distribution of computer lab in public middle school in Mexico City.
The secondary curriculum includes teaching standards for using technology in the classroom based on the International Society for Technology in Education (ISTE) and UNESCO guidelines (SEP 2011, p. 65-66). Teachers are expected to develop learning projects for students using technology. It is emphasised that in these projects teachers should:

- Use tools that promote the comprehension of knowledge and concepts, explore questions and topics of interest
- Plan and carry out research activities with their students using technology
- Use communication tools such as email, blogs, online forums
- Promote collaboration
- Develop research projects that offer solutions to authentic problems based on real life
- Use tools such as word processors, data shows, data processors
- Use social media and participate in learning networks

To teach a class using technology, teachers have to take students to the computer lab, which implies scheduling lab time in advance. While the official policy in México is to promote ICD-T use at this school level, teachers often face several obstacles using the computer room. Meetings scheduled in the lab, administrative tasks assigned to the Technology Resource teacher by the principal, special classes on trending topics such as drug addiction, bullying or obesity, equipment inventories, the lab being used for testing or as storage space are all reasons teachers have given for not being able to use the facilities at their schools. Furthermore, teachers have to mobilise approximately 40 youngsters, moving them from the classroom to the computer lab. This can reduce 50 minute class periods by as much as 15 minutes (Guerrero, 2011). Also, in larger schools, the lab can be in great demand and teachers may have to wait six weeks for their turn.

During our visits in the schools’ computer labs we noticed that the Internet connection was extremely slow and that students were using a rather out dated navigator. During one such visit, I asked the technology resource teacher about this and she explained that:

these machines were donated by the México City Government (GDF, for its initials in Spanish Gobierno del Distrito Federal) and they are set up so that you cannot download any new programs on them. So if we want to use a different navigator, we have to download it every day. Every time you turn the computer off, any new files are erased, even if you save them.

The distribution of equipment by GDF was a wide spread program during the 2006-2012 administration and all computers share this same characteristic, meaning that although the schools have machines, they were all seriously crippled before being installed. The obstacle encountered when downloading programs was most likely installed to keep users from visiting and downloading undesirable materials and software, in the logic of ‘parental guidance’ (or in this case, school guidance). While it may respond to ideas about keeping students on task by restricting their access to web pages and software, it also defeats the purpose of exploring, locating, and selecting information for academic learning.

The brief sketches of three teachers presented here are based on teachers’ narratives and the reporting of their activities in the classroom, the examination of student work, and classroom observations. The sketches are not meant to be an exhaustive recount,
but a sampler of situations that teachers have reported and their specific processes for integrating the “sometimes incoherent and often contradictory” elements discussed earlier (De Certeau, 1988, p. xi). The first teacher is Adriana who teaches seventh grade geography. In the national curriculum, the program of study is organised around ‘competencies’, defined as the integration of knowledge, abilities, attitudes, and values. The other two teachers, Hilda and Lucia, teach Spanish (language arts). The language arts program in Mexico for grades 7-9 is divided into three domains: literature, study skills, and social participation. The curriculum explicitly advocates a “social practice approach” but upon closer scrutiny it becomes clear that the contents for study are organised around text genres, isolated language skills, and grammar. It is also important to point out that all of the teachers had a working knowledge of using the computer and navigating the Internet.

The school year is divided into five grading periods of approximately two months each, and teachers are expected to cover all topics listed in their study programs. Recently, at the suggestion of the World Bank (Peon, 2009), students are measured on ‘word per minute’ reading performance in each grading period and this score is included in their report card. Spanish teachers are responsible for administering these individualised examinations that reduce their classroom time for other activities.

Adriana: “Les permitío pensar un poco” (It allowed them to think a little).

For the last twelve years Adriana has taught geography in a junior high school located in a working-class neighbourhood on the east side of Mexico City. Before coming to LETS, she participated in two in-service courses for using technology in the classroom, one a general course on how to use technology in the classroom and the second on how to use electronic whiteboards. She is familiar with a number of digital tools and an avid smartphone user, sending messages, bringing up Google Maps and email. She also uses the phone’s camera, particularly for taking pictures of geographical elements that can be useful at school. At work she goes to the computer lab with her students as often as once a week, mostly asking students to search for information.

In her teaching she is particularly interested in developing students’ “research capacity”. She believes that for students, technology is a means of communication and is a resource they have at arms’ reach. For using it at work, she is concerned about how to make ICT easy to use and understand because “many software programs are very technical”.

At the beginning of the school year Adriana was not able to use the school computer lab as all equipment was being inventoried. In November her students did a report on different conceptualisations of the origin of the solar system. First she asked students to look up several medieval and renaissance scientists and locate their theories. The idea was for students to organise the theories chronologically and then compare conceptualisations to see if they could identify how theories shifted and changed over time. But this assignment morphed into a report on the biography of each scientist, losing the analytical quality of the original assignment and opened the door for students to simply reproduce the information found in a PowerPoint presentation. In January she began working with students on the topic of national patrimony [natural resources and cultural sites]. The students had visited several museums and Adriana wanted them develop a tourist pamphlet that combined their experience of going to the museums with information about the exhibits as a sort of invitation to others to visit them. As in the case of the scientists, when the students came to the computer lab, Adriana changed the assignment and told them to write a pamphlet on their National...
Patrimony. She gave specific instructions, indicating that they should answer the questions:

- “What is the definition of national patrimony?”
- “Types of patrimony?”
- “What is tangible patrimony?”
- “What is intangible patrimony?”

Other than defining the text genre (pamphlet) and the questions, she did not give any other instructions. As students began to work in small groups, they proceeded in different manners. Some searched ‘pamphlet’ in Google to get an idea about what their final product should look like. Others proceeded to look for definitions and copy and paste them onto a blank screen. One team opened a project in Microsoft Publisher and began to copy and paste information into it. A few students divided a page in their notebook into three columns and copied by hand from the screen.

Figure 2: Students copying from screens into notebooks.

Figure 3: Student’s work, notebook page folded in three; text says: ‘What is patimony? Patrimonio is the set of assets inherited by a person’ (Qué es el patrimonio? Patrimonio es el conjunto de vienes eredado por una persona) [Transcription reproduces student’s spelling. Question is written in red, answer in black]

Adriana circled around the room and supervised her students. When she realised that many of them were using Wikipedia, she shouted out to the group, “And don’t use Wikipedia”. As she approached one student, he asked “Why not Wikipedia” and, after waiting several seconds, she answered “the information is not reliable, everybody tampers with it” (“La información no es confiable; todo el mundo le mete mano”).
She continued touring the computer lab. She watched another student for several minutes before going up to his screen, pointing to his work she declared “Esto a mi no me sirve” (literally: “this is useless” or “this is no good to me”). It was not completely clear why she had said that, perhaps it was because all of his text was copied from an unnamed source. Upon reviewing the work her students turned in, she was disappointed to discover that most of it was reproduced directly from the electronic sources (either copy and pasted directly into their pamphlet or copied by hand into their notebooks) even though she often accepted this kind of work in the past. In a chat session with me some days later, she reported that in the classroom, she had given her students a print out of blank PowerPoint screen, and asked them to rethink their work and this time write their own texts. I asked her how she went about supporting their composition process and she replied that one student read out loud to the group from the textbook, and then “poco a poco” (“little by little”) they wrote their own texts. When I asked on how they might have transformed what they read in their textbooks into their own writing she reported that “these screens allowed them to think a little”, underlining the belief that the materials (and not necessarily the activity or her interactions with them) determined the work students produced and suggesting perhaps a belief that the students previously were not thinking.

Hilda: “Dar el tema” (Teaching topics)

Hilda is a young teacher with five years teaching experience. Before beginning her collaboration at LETS, she was already familiar with the computer and Internet, and had taken a computer course at the Centro de Capacitación para el Trabajo Industrial (CECATT). She had a working knowledge of word processing software, spread sheets, and presentation software. She also had Facebook and Microsoft Messenger accounts and noted that she used the computer to download photos from her camera; she uses other devices such as a mobile phone and automatic teller machines. She reported that she uses Facebook for family affairs and sometimes, when she needs help doing something new on the computer, she consults with others or she asks students for help. In her teaching she uses technology to “research the topics”, write lesson plans and periodic “plan de trabajo” (work plan) that she turns into her principal; however, she stated that she rarely takes students to the computer lab. She believes her students are generally not attracted to school and that they are rarely interested in assignments.

Previous to our September 2012 meeting we asked teachers, via email, about the activities they had organised during the first month of school with their students. Hilda noted that she practically did not use technology during the month as it was the end of the grading period and she was caught up in the paper work.

The two activities Hilda reported in the October meeting were a double entry table and a mental map produced by students on the computer, using the Internet for locating information and images. For this period, the topics of study presented in the curriculum includes “myths and legends” as part of the literature strand, and as part of the study habits domain, “presentation of information”. Her reading of the curriculum is quite literal and she believes, as do many do of the teachers with whom we have worked, that her job is to teach each topic, one by one. A standard organisation of a thematic unit at this level is to introduce the topic, present definitions and characteristics, give a reading assignment and ask students to write a summary, an outline or make an oral presentation.

In this case, as in others we have documented (for example, monograph and language diversity), Hilda developed procedures for covering curricular content and combined the content from two different curricular domains. Students created a chart and a conceptual map (a topic required in study domain) about myths and legends (a
topic required in literature domain), although it is not clear if they actually read or discussed any works as part of contrasting and comparing. When we asked her for her evaluation of this assignment, she expressed concern that what she asked students to do would somehow distort the curricular mandate. “I am concerned that my [LETS] topic does not coincide [with the curricular topic], [what the students did] is not about looking for information, it refers to the representation of information”. Hilda seems to have fragmented searching for information from recording it, and does not seem to connect recording, representing, and analysing information. This could be due, at least in part, to her understanding of the Spanish curriculum that also explicitly separates these activities.

In the computer lab students completed two assignments: for the first they created the table described above by searching for the characteristics of myths and legends and contrasted them. Second, she asked her students to make a conceptual map of the notions of myths and legends. Hilda believed that these activities could not be organised properly as there were not enough computers in her school for each student to have their own and she believed that students should work individually in the lab.

Below is an example of one student’s work, the information it contains was copied and pasted or closely paraphrased from Yahoo. A translation reflecting student syntax and phrasing in Spanish is included below the original texts.

<table>
<thead>
<tr>
<th>Características</th>
<th>Diferencias</th>
</tr>
</thead>
</table>
| **Pueden ser ficticias o verdaderas**  
*Can be fictious or true* | **El tiempo y el espacio es muy indefinido en los mitos en las leyendas es definido**  
*Time and space is very undefined in myths and defined in legends* |
| **Ambos son de tradición oral**  
*Both are from oral tradition* | **En el mito es demasiada exagerada la historia y en la leyenda no**  
*In myths the story is exaggerated and in legends not* |
| **Lo que relatan era aceptado por la comunidad**  
*What they narrate was accepted by the community* | **En las leyendas son personajes normales y en el mito son dioses monstruos o gigantes**  
*In legends the characters are normal and in myths they are monsters or gods* |
| **Pasó hace bastante tiempo**  
*It happened a long time ago* | **En el mito trata de explicar la existencia del hombre, las conductas, los fenómenos naturales, las instituciones y en la leyenda no**  
*The myth tries to explain the existence of man, behaviors, natural phenomena, institutions and legends no* |

**Figure 4:** Student’s comparison of myths and legends

Most students’ tables are quite similar to the one above. To create the mental map of these same concepts, this particular student read a myth online, copied, pasted, and illustrated it. There is no apparent relationship between the two parts of the assignment, the only common denominator seems to be that they were done on the computer and are part of the curricular construction of the topic. The summarising of the characteristics of myths and legends is independent from the myth they read and the presentation of the myth synthesizes its content but doesn’t illustrate any of its stated characteristics.
In this activity, Hilda ventured for the first time into the computer lab and designed two activities for students. She also faced an organisational problem (students work individually or in pairs or small groups), an issue she contemplated at other times during the school year. Her assignment and her students’ work are characteristic of deep set school practices in Mexican middle schools. Teachers tend to ask closed questions and students find answers online and reproduce them. These types of assignments were common before the advent of computers in schools where students copied by hand or cut out informative texts and illustrations bought at local papeles (small stationery stores).

While the assignment was common fare, Hilda’s reaction was not. She generally believed that her students were apathetic and reported being very surprised by their engagement and interest in using computers in class. She did not believe that they would be interested, and was pleased when they were.

Another activity that she reported in November was asking students to produce a video instead of a written report for one of their projects. The ‘monograph’ is a topic in the curriculum and is part of study strand. She covered the topic by presenting to her class information regarding “what is a monograph”, “types of monographs”, and “the characteristics of a monograph”; students then read their text book’s explanation as well, and they were asked to take notes on the same topic. She gave this assignment after a session at LETS where teachers also created a video. Following the suggestions in the curriculum, the students were asked to choose a recent topic from their geography or biology class as the subject of their video. Their work is similar to the legend and myth example, for the most part they created their video by copying information and images and placing them in Movie Maker. But even with these limitations, Hilda is moving in a new direction by considering academic products other than essays, summaries and reports.

During the spring of 2013, LETS held a series of virtual meetings with teachers, and Hilda participated actively in these. One of the most recent changes in her teaching is that she has begun to redefine how she gives assignments to students. This is best illustrated by her attempts to encourage students to propose their own questions for research, after introducing the topic in class. The most difficult situation that she has encountered is that the students’ questions are much broader than the ones she usually asks, and she has had to develop new approaches for classroom discussions and for organising and orienting their work in the computer lab.

In March and April, Hilda tried a different way of organising a thematic unit on indigenous languages of México, a topic in the seventh grade study program. She began by sending an email to her students inviting them to collaborate in a map locating the main language groups in México.
Beyond common explanations

She then organised her students in pairs—an innovation for her—and assigned them each a language to research, asking them to produce a short video documenting the location, culture, customs, and daily life of the different linguistic communities. She asked her students to write short texts, images, include a map, and their sources of information. Those students who completed the assignment for the most part met her expectations, although not all students turned in a final product. When explaining this assignment, Hilda stressed the idea that they should not copy and paste texts. She found signs of students’ attempts to use information they found in different ways: for example, two girls summarised and articulated information from more than one source; something new in Hilda’s classroom; another student further developed the indigenous language map described above and included the number of speakers of each language group, and a third student wrote phrases such as “According to the 2005 Mexican census there are 49,000 speakers” (De acuerdo al censo mexicano de 2005 cuenta con 49,000 hablantes”) as a way of referring to information he found without copying it. Readers who understand Spanish will note the non-conventional use of “de acuerdo al” instead of “de acuerdo con”, a phrasing that suggests that this is the student’s wording. Each of these student responses reflects Hilda’s effort to redesign assignments and redefine expectations for her students.

Lucia: “¿Cuál es el propósito?” (What is the purpose?)
Lucia is a young teacher with just three years classroom experience. She is an eighth grade language arts teacher at a medium size middle school in the south eastern end of México City. She is technologically savvy, and reported using the computer and Internet before coming to LETS for “for research, for communicating with others, for sending and receiving work”. Before joining us, she had used Microsoft Word and PowerPoint in her teaching, and looked for and selected videos for students to watch. She believes that for students to learn, they need to understand the purpose of their assignments, what she expects them to learn, and what the final product will be. She believes that this approach will help students “appropriate the tools that are necessary for effectively adapting to a society in constant change. (Brindarles las herramientas necesarias para adaptarse eficazmente a una sociedad en constante cambio).

As part of her activities in LETS, she tried to establish a relationship with another teacher in the group by sending her emails and sharing work with her. She was disappointed that her colleague never answered her. Although Lucía hoped to continue her conversations beyond the group meetings, teacher collaboration, in México, is uncommon and not a widespread practice. In October she presented her use of Google
Maps for doing book reports on Latin American authors. Students were first asked to choose five authors and a story from each one. After reading the stories and researching the authors’ lives, students located each one on a map, inserting photos and commentary regarding the stories they read.

When students were about half way through the project, Lucia had to suspend it because the principal had organised a special course on drug addiction that was held in the computer lab and she no longer had access. Since then she has organised activities around writing and recording an audio book, writing a biography using hypertext and, most recently, animated cartoons based on current events. In December 2012, Lucia opened a Facebook page to use with her students and invited their parents to visit it whenever they wanted. She uses this page to post information about assignments and publish students’ work; her students also use it to post comments and ask questions.

![Figure 6: Lucia’s Facebook page where she sends her students materials, answers questions, receives comments and publishes their work](image)

At the beginning of 2013, Lucia and her class worked on the curricular topic ‘Biography’. The program of study suggests that students write a biography and list characteristics of this genre. Lucia organised the students into groups and asked them to choose somebody they knew and interview them as the initial activity for this unit. Collectively they decided to ask their interview subjects about their childhood and school years, their jobs and daily activities and the most significant moments in their lives. Once they collected this information she the students wrote the person’s biography: Lucia taught them how to create a hypertext, using PowerPoint as the basis of their text and illustrations. Each group developed one hypertext biography to present to their classmates. This work could not be posted on Facebook because it did not keep the links, so she opted for class presentations of their finished projects. Before starting them, Lucia asked her class, “Based on your experience, what is a biography? What are its characteristics?” The students articulated definitions on the spot and commented on what they considered to be its most important aspects. They then proceeded to present and comment on their work.
Teachers’ travel and errant trajectories

The descriptions of Hilda, Adriana, and Lucia incorporating technology into their classrooms illustrates how diverse and complex the endeavour is. Their portraits depict teachers’ processes for dealing with a variety of factors that directly affect and influence the decisions they make when trying to learn to do something they already know how to do: teach (Lave 2011). The purpose of this section is to foreground the teachers’ diverse and errant paths, and explore how they dealt with and resolved the variety of factors and unexpected situations that impacted how they worked with their students. While any one teacher’s experience cannot be generalised to others, the common denominator for this and other similar situations of educational change is the heterogeneity of teachers’ responses to demands, and the very different ways teachers turn to their own means and resources—their experience, beliefs, professional background, technological know-how, interactions with others—to make sense and act in specific teaching events (de Certeau 1988; Lave 2011).

In examining these teachers’ participation and processes we have found that:

- Teachers have different starting points for participating in innovation projects such as this one: they have established classroom routines, years of experience, disciplinary knowledge, relationships with school authorities and co-workers, and technological practices (Jackson 1990; Guerrero 2011; Guerrero and Kalman, 2010; Warschauer 2002).
- Despite the official discourse that encourages and demands the use of technology at school, teachers’ work is often waylaid by institutional conditions and the decisions of others (Kalman and Rendón, forthcoming; MacFarlane 2003).
- By being a part of the LETS project, using digital technology, and discussing the affordances and limitations of digital culture, teachers often find themselves confronting different and often conflicting beliefs and pedagogical approaches, an experience that may be new to them.
- There are deeply sedimented teaching traditions that often opaque other options for organising learning.

These sketches also illustrate how teachers make different decisions in order to meet the institutional and social demands of using ICD-T with students. Some teachers glide with
relative ease through the operational aspects of technology, and they also deal with complexities and inconveniences as they arise; others struggle to understand how they might reorganise classroom work to take into account the ethos of digital culture, only to find that it opens so many new questions and challenges that they have to continuously rethink their decisions and increase their options; still others simply cling to “business as usual” teaching and use the keyboard and the screen to reiterate their established modus operandi. While all of the teachers discussed in this paper face using technology and incorporating similar elements into their work, their “phrasing” (De Certeau, 1988, p. xviii) seems quite different to us.

The errant trajectories described here include negotiating through policies, inadequate infrastructure, teaching traditions, assignment design issues, finding solutions for unexpected snafus, beliefs, professional background, and integrating some of the ideas and proposals from LETS. Given that this project is in process, there is a certain risk when coming to premature conceptualisations. For the sake of discussion, however, these teachers’ work, learning and participation can be understood through three metaphors, all of them related to travel or the idea of getting from one place to another. As shown in the figure below, trails are not linear or direct but twisting and turning and made up of advancing ones’s path and retracing it.

Some teachers seem to have a direct itinerary. As they pass through diverse social contexts, appropriate different social practices, and interact in multiple institutional spaces (Gee et al. 1996), they collect souvenirs from different places (technological know-how, new teaching approaches, innovative activities,) and articulate them in a variety of ways with their students. This is not to say that they do not encounter unexpected contingencies or unforeseen obstacles, but they mobilise their resources or find new ones to solve problems and continue with their work (Kress 2003; De Certeau 1988). Just as the traveller might find the unexpected puddle or a detour in the road, these teachers encounter closed computer labs, uncooperative students, computers that do not save work, or days when there is no Internet at school. They make modifications...
to their activity; they reorganise and redistribute time, or introduce a new option to students (Guerrero 2011; Rendón 2012). Lucia is a seasoned traveller in this sense, despite the reduced number of years she has been teaching.

She is at ease with technology and her work in the classroom suggests that she often rethinks how to teach what she wants to teach, and get around the confines of the curriculum and institutional obstacles she faces. She uses her technological know-how and understanding of digital culture to organise ambitious products, uses Facebook to communicate with her students and publish their work, and designs assignments where students use multiple forms of representations and develop their own ideas (Matthewman 2004). Her path seems to transform and surpass the expectations expressed in the official policies into activities rooted in her understanding of digital culture as a context for learning.

Other teachers seem to travel a wandering path, a network of interlinked side roads. Hilda is familiar with technology, uses it in her daily life, but has not used it much in her teaching until now. Incorporating the computer for designing cultural objects (New London Group 1996) and searching the Internet has made her question long held beliefs about her role as the teacher. When she saw her students’ work, she began to realise that most of it was limited to copying and pasting from other electronic sources, and this led her to think more about teaching and learning, about how she gave assignments, and about what she expected students to do (Sutherland et al. 2009). She back tracked over known territory and reconsidered her established way of giving assignments, particularly in the way questions were asked in her classroom. This in turn, brought on new situations and challenges for her.

She also revisited some of the assignments she gave, tried new ways of organising content and student work, and rethought some of her expectations of her students. One observable change in Hilda’s practice is her recognition of different modes of representation as valid for academic work, as seen in her attempts to design activities that are not restricted to writing a paper, creating a table or a conceptual map. Her trail is full of tracks back and forth between issues related to adapting the curriculum, design decisions, her beliefs about her students and taking into account the ideas presented in LETS.

Finally, the third metaphor is the traveller on a scheduled tour. The destination is set, the meals are pre-planned, and the means of transportation worked out. All this traveller has to do is get on the bus on time. There is no time to stroll, no need to deal with the unexpected. Here the teacher uses digital technology for “business as usual” and avoids wandering away from the planned activity even when she experiences bumps in the road or involuntary detours. Adriana seems to be this kind of teacher. Unlike the others, she does not back-up and take a different road to see where it might take her. She is quite familiar with the computer and uses the Internet for her own purposes, but this knowledge is not shared with her students. What goes on in her class is very much aligned with a traditional view of the classroom, what Rogoff et al. (2003, p. 184) defines as “hierarchical structure, organised with fixed roles in which someone manages others’ participation, acting as a boss”. She does not question her role or her position (and much less her students’) and adheres to the tenets of authoritarian teaching where she tells her students what to do, has the final say, and disqualifies their work without hesitation. Here, Adriana asks the questions, she decides what is useful and what is not, and she is not open to suggestions. She gives assignments that can be resolved by copying a definition, by giving yes/no answers, or by locating diagrams or maps and simply reproducing them. She seems to grasp the formal aspects of using technology (the students, after all, are on the computer) but is not open (yet) to some of the principles of learning in a digital medium. She believes that she is innovating simply by
using the computer but despite the affordances the computer and digital culture offer, she makes few changes in her teaching, preserving what she has always done. Adriana does not seem to have any conflicts or doubts; she uses the computers installed in her school for doing the types of activities and evaluating her students as she has always done. Her work is heavily influenced by the teaching traditions present in her context and her professional training regarding how students should learn and how teachers should teach. Despite her technological know how, suggestive ideas about how to rethink classroom teaching coming from participating in digital environments or the LETS sessions do not seem to make a mark on what she does or what she thinks.

Beyond traditional explanations

The premise of this paper is that within our study, the teachers’ efforts to incorporate technology into their work are the result of integrating, complex, heterogeneous and often contradictory elements. The argument here is that common explanations such as lack of training opportunities or unavailable materials do not fully explain why some teachers do what they do. Each of these may be a contributing factor but they alone do not allow us to have a deeper understanding of the difficulties teachers face, nor do not they clarify teachers’ decisions and subsequent actions. We have presented portraits of teachers with different stances toward technology and teaching, and we have shown that specific software is not necessary for innovation. All of our teachers have had the same opportunity for professional development through participating in LETS, and yet their responses, as exemplified by the three portraits presented, are quite different.

The analysis in this paper illustrates the intensely contradictory context in which teachers in Mexico find themselves. On one hand they are encouraged—even pressured by official discourse, international and national educational policy and public opinion, to use technology at school, to incorporate the Internet into their teaching and resources, and “expand access to learning, improve quality and ensure inclusion.” (UNESCO 2013). On the other hand they have to figure out ways to circumvent conditions such as computers that have restricted use, lack of access to the computer lab, time limitations, and a complex, extensive program of study. As shown here, using the computer and the Internet can be an uphill climb for teachers from beginning to end.

They also face integrating their beliefs about learning, about their students and their role as teachers, with what digital culture has to offer. Despite the physical presence of computers, the research at LETS (Guerrero, 2011; Rendon, 2012; Hernández, forthcoming, Kalman and Guerrero, 2013; Guerrero and Kalman, 2010, Guerrero and Kalman, 2011; Kalman and Hernández, 2013; Kalman y Rendón, forthcoming; Solis, 2009), and the research of others (Cuban 2000; Lankshear & Knobel 2011; Law 2004; Leu 2002; Rojano 2003; Sutherland et al. 2004) has shown that this is not enough to transform teaching or improve learning in any substantial way. The foundations and basic tenets of traditional schooling seem to stay intact with or without computers or the Internet, unless they are directly addressed, examined and questioned. As Lankshear and Knobel (2011) point out, in the rise and dissemination of new literacies and digital technology, schools are behind the times.

The incorporation of technology in schools greatly depends on how teachers include it in their teaching, and their appropriation of its possibilities beyond operation. It implies a construction not only of technology’s multiple uses and tools, but also an understanding of the values, priorities—the ethos—of digital culture, including the aspects of learning. Teachers’ errant trajectories are the result of their particular articulation of the multiple and heterogeneous elements encountered and the obstacles they meet when working toward incorporating technology into their classrooms. This
reminds us of how a successful transformation of teaching practice can, and often does, generate new problems to be resolved and reminded us of how professional development itself is rarely a smooth path. Policy and professional development, to be effective, will have to take teachers’ errant trajectories into account. It will have to provide multiple occasions for modelling new practices, teachers’ learning, and opportunities to try different approaches to teaching while allowing them to reflect with others.

Notes

1 All translations in the text are mine, rather than literal transcriptions they are written to “sound” as native like as possible.
2 The role of international agencies in the shaping of national policies in Mexico is beyond the scope of this paper, and requires a discussion of its own. However, it should be noted that international agencies such as UNESCO, World Bank and OECD and regional ones such as OEI and CEPAL share similar policies regarding the incorporation of technology into education. They promote the idea of a globalised world connected through the Internet and knowledge as the new and most coveted commodity for economic development, political stability, and democratisation. They see the incorporation of technology into schools as an important step towards reaching marginalised groups in remote areas, improving educational outcomes, and educating the workforce, eventually leading to market competitiveness and prosperity. The distribution of equipment is promoted as a ‘must do’ to insure closing the so-called digital divide. These elements are present in Mexican policies and political speeches (see, for example President Calderon’s remarks in 2010 (http://spanish.china.org.cn/international/txt/2010-05/01/content_19949553.htm). For a look at international policies, consult OECD, (2010); Sunkel (2006); Jara, (2007) Unesco (2012); for a more critical discussion Warschauer, (2002) and Collins and Blot (2002).
3 The research reported in this paper is supported by the Consejo Nacional de Ciencia y Tecnología in Mexico through the research grant 157675 for the ongoing project “Los profesores y las TIC: la apropiación de conocimiento en la práctica”. My sincerest gratitude to Wendy Piza and Victor Rendón of LETS for their assistance with the data presented in this paper and their discussion of earlier formulations. The work done in LETS is intensely collective, when referring to collaborative ideas, I use the first person plural we, when discussing my ideas and decisions in writing this paper, I use the singular I. Also, thanks to Enna Carvajal for her constructive critique of earlier versions.
4 In research literature and other publications, digital technology and connectivity are often summarised as Information and Communication Technology and referred to as ICT. However, this leaves out a very important part of digital culture, namely the multiple tools, platforms, virtual spaces and resources that people use to make their own designs in a variety of representative modes. Furthermore, the “C” is often forgotten, leaving out the powerful tools for exchange that connectivity offers. For this reason, we are suggesting here to broaden the term to Information, Communication and Design Technology (ICD-T) as a way of putting the technology user back in the picture. See Buckingham, 2007.
5 All names are pseudonyms.
6 Although an important number of teachers who collaborate with LETS may begin without a working knowledge of computer use or wide spread practices (email for example), for the purpose of this paper, I chose teachers’ whose working knowledge is comparable.
References
Kalman, Judy, & Guerrero, E. (2013). A social practice approach to understanding teachers learning to use technology and digital literacies in their classrooms. E-Learning and Digital Media, Volume 10(3).


**Biographical statement**

*Judy Kalman* is a professor at the Departamento de Investigaciones Educativas (DIE) of the Centro de Investigación y Estudios Avanzados del IPN (CINVESTAV) in Mexico City. Her work centers on the social construction of literacy, everyday literacy use, and reading and writing in school settings; more recently she has extended her research agenda to include digital literacies. She has authored articles in Spanish, English and Portuguese in academic research journals as well as practitioner-oriented publications. She has also collaborated with the Secretaría de Educación Pública in Mexico on programs designed for creating learning opportunities for adult learners, evaluating new curricular proposals, and writing materials for the language arts programs for students in rural secondary schools. In 2002 she was the recipient for the International Literacy Research given by the UNESCO Institute of Education for her literacy work with unschooled and under schooled women. She is a member of the Mexican Academy of Science since 2004. Her current work is centered on literacy and ICT technologies in and out of school. In 2008 she co-founded the Laboratorio de Educación, Tecnología y Sociedad where she is currently its director at the CINVESTAV South campus.

Contact: judymx@gmail.com