Challenges of Professional Development for Technology Integration in Higher Education

Retos del desarrollo profesional para la integración de las tecnologías en la educación superior

Desafios do desenvolvimento profissional para a integração de tecnologias no ensino superior

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Abstract

The Teacher Professional Development (TPD) models, approaches, and programs have contributed to some extent to overcome the barriers that higher education faculty experience as regards ICT adoption for student learning. However, their impact on practice is still limited. The current scenario in education is complex and demands new approaches regarding TPD for ICT. The present research uses Expansive Learning as the analytical approach to study the factors that limit ICT integration as well as the challenges of TPD for ICT adoption in Higher Education (ICT-TPD) to address limitations. Four main challenges were found and are herein described in order to propose an organizational-oriented development model, to wit: (1) a required collective cross-level development approach, (2) an approach where problems or limitations are essential to surpass boundaries, (3) a cultural appropriation of ICT and (4) the influence of power relations.

Keywords: teacher professional development, information and communication technology, professors' barriers, higher education, activity theory.

Resumen

Los modelos, enfoques y programas de desarrollo profesional docente (TPD) han contribuido en cierta medida a superar las barreras que el profesorado en Educación Superior experimenta para la adopción de las Tecnologías de Información y Comunicación (TIC) para el aprendizaje de los alumnos. Sin embargo, su impacto en la práctica es aún limitado. El escenario actual en la Educación es complejo y exige nuevos enfoques de Desarrollo Profesional para integrar las TIC de manera adecuada. Este estudio utiliza como enfoque analítico el Aprendizaje Expansivo para estudiar los factores que limitan la integración de las TIC, y los desafíos del TPD (ICT-TPD) para la adopción de estas en Educación Superior. Se identificaron cuatro desafíos principales, los que se describen con más detalle para proponer un modelo de desarrollo organizacional: (1) un enfoque de desarrollo colectivo transversal, (2) un enfoque donde los problemas o limitaciones son fundamentales para superar los límites, (3) una apropiación cultural de las TIC y (4) la incidencia de las relaciones de poder.

Palabras clave: desarrollo profesional docente, tecnología de información y comunicación, barreras de profesores, educación superior, teoría de la actividad.

Resumo

Padrões, abordagens e programas de desenvolvimento profissional docente têm contribuído em parte para superar as barreiras que os professores do ensino superior experimentam na adoção das Tecnologias da Informação e Comunicação (TICs) no processo de aprendizagem. No entanto, seu impacto na prática ainda é limitado. O cenário atual da educação é complexo e exige novas abordagens do TPD para inserir as TICs adequadamente. Essa pesquisa utiliza como abordagem analítica a aprendizagem expansiva aos fins de examinar os fatores que limitam a inserção das TICs e os desafios do TPD (ICT-TPD) para a adoção delas no ensino superior. Foram identificados quatro desafios principais, os quais são descritos com mais detalhes para propor um padrão de desenvolvimento organizacional: (1) uma abordagem de desenvolvimento coletivo transversal, (2) uma abordagem na qual os problemas ou obstáculos são fundamentais para superar os limites, (3) uma apropriação cultural das TICs e (4) a incidência das relações de poder.

Palavras-chave: desenvolvimento profissional de professores, tecnologia da informação e comunicação, barreiras para professores, ensino superior, teoria da atividade.

Introduction

During the last decades research has recognized the potential benefits of Information and Communication Technology (ICT) in education: the development of students' communication skills, the students' control upon learning, and the fostering of students' motivations toward the learning of specific contents such as sciences and mathematics (Ben Youssef & Dahmani, 2008), among others. However, there is a lack of significant evidence of a real achievement of the promised transformation of education through technology. According to Kirkup & Kirkwood (2005), when a teacher adopts technology is mainly to improve the existing practices rather than to transform them.

There is consensus on the central role of professors in the transformation of higher education (Gilakjani & Leong, 2012). According to Gladhart (2001 in Toledo, 2005), during the adoption of ICT professors go through five stages: entry, adoption, adaptation, appropriation, and invention. To Russel (1996 in Toledo, 2005), professors start at a level of awareness, then move toward learning the process, then understanding the application of the process, gaining familiarity, and confidence, adapting it to other contexts, and end up applying creative applications to new contexts. For Toledo (2005), the stages professors go through in order to integrate technology in curriculum are as follows: pre-integration, transition, development, expansion, and a system-wide integration remarks on the importance of institutional developmental integration of technology. Meanwhile, for Gladhart and Russel the concept of adoption is related to the professor's individual use of technology in the classroom, as the leading actor in the process. The changes occur mainly in the professors' pedagogy, contents, and in the students' learning. As a result, the study of barriers to understand limitations for the integration of ICT in education remains at the professors' level.

Regarding the study of barriers, Ertmer's (1999) approach classifies them by first and second-order barriers. As stated by Ertmer (1999), incremental changes require the overcoming of external barriers. However, profound changes require the confrontation and modification of teachers' beliefs. TPD's approaches for ICT integration have mainly addressed the challenges from an individual dimension and in a disjointed way between external and internal barriers.

Kennedy (2005) classifies general models of TPD by purposes and by the level of professional autonomy fostered in the practitioner. The first category is oriented to traditional approaches of training based on transmission and development of skills to show teachers' competence and completion of award-bearing programs of study. The second category of transitional models of TPD is related to standard-base models, coaching/mentoring, and communities of practice. While the coaching/mentoring model privileges the one-to-one relationship, the model of a community of practice relies on social and situated learning within a community of practitioners. The third category of transformative models of TPD underlines the capacity of the model to transform the practice. TPD for ICT is mainly based on the models of transmission and transition. However, transformative approaches are needed to solve conflicting agendas and philosophies (Kennedy, 2005). Technology integration in education needs collective approaches in order to widely take into consideration the influence of other roles in education; other voices not commonly taken into consideration.

Although some researches recognize the limited results of the adoption of ICT despite the significant efforts of professional development (Buabeng-Andoh, 2012), other studies consider TPD for ICT as a substantial barrier (Al-Senaidi, Lin & Poirot, 2009; Goktas, Gedik & Baydas, 2013; Pelgrum, 2001). According to Schneckenberg (2009), it is necessary to modify the traditional approaches to TPD. Ben Youssef &

Dahmani (2008) support the idea of an organizational learning regarding technology integration instead of an individual learning. However, new approaches to TPD also require new approaches in order to understand the limitations of ICT integration. The present study makes use of an Expansive Learning approach (Engeström, 2015) in order to answer the following question: What are the contemporary challenges faced by professional development in order to overcome barriers for ICT integration at the Universidad Nacional in Costa Rica?

Literature Review

Despite the central role of TPD in the adoption of technology and the corresponding high investments in training, literature reports limited results (Buabeng-Andoh, 2012). The reasons are mostly related to teachers' external and internal barriers to change (Ertmer, 1999). From the professors' perspective, the external barriers are mere conditions of adoption and they are not expected to be able to solve them since internal barriers are directly linked to the professors' fundamental beliefs (Woo, 2016). Since changes are internal processes, it is expected that professors themselves turn them into beliefs. Nonetheless, changes in beliefs are not effortless processes and they are not consciously undertaken by professors.

Teacher Professional Development is an essential tool to trigger changes in teachers' beliefs. However TPD for ICT has a double role in the field of educational technology, both as a barrier and as an enabler. The low quality of professional development -or the lack thereof- has drawn the attention and been analyzed in specific literature regarding barriers and enablers for ICT adoption (Fu, 2013; Shahadat, Khan, Hasan, Kum & Prof, 2012). According to Goktas et al. (2013), in-service training has not played a significant role in increasing teachers' ICT proficiencies.

To Ertmer (1999), external barriers can be overcome as long as money is allocated. Therefore, the approaches of professional development to overcome barriers pay particular attention to second-order barriers. Professors' internal limitations such as lack of knowledge, skills, or competencies in technology have been addressed through teacher-centered and technological-pedagogical content-related programs, courses, and workshops. Brinkerhoff (2005) found partial success in the development of technology-related skills in a long-term design yet further results showed no significant changes during the TPD process. Similarly, Uslu (2012) found an increase in sustained technology integration and changes in attitudes of teachers towards technology up to six weeks after the end of the TPD process. However, no significant differences were observed afterwards.

Ertmer (2005) suggests three strategies that must be taken into consideration by TPD for ICT to trigger changes in professors' beliefs: personal experiences, vicarious experiences, and social-cultural influence. Furthermore, TDP for ICT should include ongoing public conversations, opportunities to observe others' classroom practices, gradual introduction to technologies, as well as technical and pedagogical support to develop instructional strategies to change teachers' pedagogical beliefs. Moreover, through the creation of small communities of practice, teachers can jointly explore new teaching methods, tools, and beliefs to transform their practice. According to Rogers & Twidle (2013), TPD for ICT oriented toward the examination of teachers' beliefs has significant implications for its integration in curriculum and leads to changes in professors' pedagogy. Moreover, professional development initiatives intend to trigger changes in fundamental beliefs through the technical and pedagogical development of competencies as a way of increasing confidence and practice (Prestridge, 2012).

Regarding the length of time, some researchers discuss the inadequacy of one-size-fits-all types and short-term initiatives (Uslu, 2012). Aduwa-Ogiegbaen (2014) states that workshops, conferences, and seminars are the favorite resources for teachers, followed by courses. Conversely, Wang et al. (2014) as well as Plair (2008) support the notion of long-duration TPD in order to master technical skills and to provide teachers with the necessary time for reflection. Rogers & Twidle (2013) acknowledge that a combination of personal hands-on experience and cooperation with other colleagues is a good alternative, and they call for a mix of short and long courses with distinctive objectives. Moreover, some literature suggests that successful initiatives of professional development provide teachers with active learning: personal reflection and teachers talks, collaboration and iteration between training and classroom activity. Goktas et al. (2008) support the notion of a link between curriculum and hands-on and in-depth practice, and Lavonen et al. (2006) highlight the importance of emphasizing empowerment, communication, and context.

Recently, the importance of socio-cultural approaches to teacher learning has been acknowledged as an impact factor of TPD for ICT (Woo, 2016). Regarding professional development in a broad sense, Postholm (2012) highlights the influence of individual and organizational factors in teachers' learning and the cooperation among educators and the existence of a positive school culture. Learning at the workplace and collaboration between practitioners are both close to the approach of legitimate participation of practitioners in communities of practice. (Bloch, 1994). For Daly et al. (2009), the development of Communities of Practice (CoP) is an essential part of successful experiences of ICT adoption. According to Coto (2010), the Communities of Practice facilitate teachers' reflection, support changes in instructional practices and strategies, and in beliefs and attitudes towards teaching. Besides, they support the learning of new skills and knowledge in the fields of technology and pedagogy as well as their integration in the curriculum. The study also shows how the infrastructure, the organization, and the policies affect the possibility of significant changes in the educational practice with technology.

According to Woo (2016), professional development is influenced by the particular type and context of the educational institution and should not be a haphazard decision. Currently, TPD for ICT lacks comprehensive approaches to address the complexity of ICT adoption in education adequately. As stated by Kennedy (2005), transformative models of TPD increase the capacity for professional autonomy. Due to the complex dynamics of barriers in professors when it comes to the adoption of ICT (Castro, 2016), and the importance of institutional conditions (Castro & Nyvang, 2018), TPD faces challenges for a successful use of technology in education. According to Kennedy (2005), transformative models are not without tensions. On the contrary, they rely on conflicting agendas and debates among stakeholders towards transformative practices.

Some literature stresses the importance of developing a new understanding of professional development. Reich & Hager (2014) identified six key points to be taken into consideration: 1) the practice as a collective and situated process, 2) the professional development as a socio-material phenomenon, 3) the practices are embodied, (4) practices as a result of relationships, (5) practices as a historical and social-contextual dimension of practices, and (6) practices as emergent and volitional, not fully specifiable in advance. Others emphasize the necessity of further mediation for collaboration, common spaces of cooperation with partnerships, teachers' co-learning, and the significant influence of context and culture (Avalos, 2011). According to Postholm (2012), the communication of the school vision, the administration support to professional development, the acknowledgment of support networks, and the cooperation with external actors become essential to professional development designs and implementations. TPD for ICT, as a branch

of general models of professional development, shares such challenges and adds its own. In this study, the use of Expansive Learning aims at acting as the lens to gain a broader understanding of the problems of ICT integration at UNA (Universidad Nacional, Costa Rica) and how to model TPD for ICT adoption in order to overcome current and future limitations.

Expansive Learning as a Theoretical Approach and Analytical Tool

Expansive Learning, or the third generation of Activity Theory (CHAT) (Engeström & Miettinen, 1999), is the theoretical approach used in this study to explore the challenges of teacher professional development for technology integration in education. CHAT is a framework for understanding human actions and practices (Yamazumi, 2006). A distinctive trait in CHAT is the orientation towards expansion in organizations: up and down and outwards and inwards. Such expansion in the study aims at reducing the identified gap in TPD between organizational development and individual development (Ben Youssef & Dahmani, 2008).

CHAT's second generation defines the collective activity system as the unit of analysis (Engeström & Miettinen, 1999). The minimal constitutive components of the activity system are the subject, the object, the mediating artifacts, the rules, the community, and the division of labor (Engeström, 1999). The unit of analysis is expanded in the third generation of activity theory to include, minimally, two interacting activity systems (Engeström, 2001). The five basic principles of the third generation of CHAT shift the view from traditional approaches to understanding both barriers of ICT integration and TPD-ICT in order to overcome the obstacles. According to Engeström (2001), the five principles are as follows: (1) A collective, artifact-mediated, and object-oriented activity system seen in its network relations with other activity systems as the prime unit of analysis; (2) Multi-voicedness within the activity systems and among networked Activity Systems; (3) The historical transformation of activity systems; (4) The centrality of contradictions as sources of change and development; (5) The possibility of expansive transformation in activity systems. The principle of contradictions as a source of change and development is, by nature, of central importance in the study.

According to Engeström & Sannino (2011), contradictions are philosophical concepts, historically developed, that cannot be observed directly but rather through their manifestations. The analysis adopts the methodological framework proposed by Engeström and Sannino (2011) to identify the different types of discursive manifestations of contradictions (Table 1). The framework showcases dilemmas, conflicts, critical conflicts, and double binds as types of discursive manifestations of contradictions and the linguistic cues to identify them in the discourse. The identification of the discursive manifestations of contradictions is at the base of the characterization of potential boundaries of ICT adoption and integration as well as challenges in TPD-ICT.

Table 1: Types of discursive manifestations (adapted from Engeström & Sannino, 2011, p. 375)

Discursive manifestation of contradictions	Description	Linguistic Cues
Double bind	Facing pressing and equally unacceptable alternatives in an activity system Resolution: practical transformation (going beyond words)	"we", "us", "we must", "we have to" pressing rhetorical questions, expressions of helplessness "let us do that" "we will do it"
Critical conflict	Facing contradictory motives in social interaction, feeling violated or guilty Resolution: finding new personal sense and negotiating new meanings	Personal, emotional, moral accounts, narrative structure, vivid metaphors "I now realize that [...]"
Conflict	Arguing, criticizing Resolution: finding a compromise, submitting to authority or majority	"no", "I disagree", "this is not true", "yes", "this I can accept"
Dilemma	Expression or exchange of incompatible evaluations Resolution: denial, reformulation	"on one hand [...]", "on the other hand", "yes, but" "I didn't mean that" "I actually meant"

Methodology and Context

The study was carried out with professors and administrative staff at the Universidad Nacional in Costa Rica. The participants were faculty professors, members of the University Board (UB), and information technology staff (IT staff) affiliated to academic departments that used to support faculty professors in the use of technology in their educational practices.

The study is of exploratory nature. The qualitative data was collected by using the technique of focus groups. Seven focus groups with faculty professors were organized. No specific criteria were included for the selection of participants regarding department affiliation, field of knowledge, years of experience, age, or gender.

With the purpose of using the analytical framework of the third generation of activity theory regarding the understanding of the voices of two or more subjects, three focus groups were organized with professors willing to adopt the technology. They were selected from lists provided by the Department for Educational Technology at UNA, and invited to take part in the research. The department had identified professors that innovate with technology in their teaching practices. Twenty professors were invited, of which 13 agreed to participate.

Two focus groups were organized with professors unwilling to use technology, selected by using a list provided by the heads of the academic departments since they know better the type of professors' profile in their respective departments. Twenty-eight professors were invited, of which four participated in the two focus groups.

There also was one focus group comprised by professors who were engaged in professional development activities for ICT adoption. The institutional department for educational technology provided four lists of professors that had taken part in recent courses. A total number of 51 professors were invited, of which four participated. The two main topics of dialogue in the focus groups were the professors' experiences and opinions regarding ICT adoption and about institutional and professional development for ICT adoption. This focus group was essential for the study to provide information related to professional development, although the topic was also discussed in the two previous focus groups with professors.

Three interviews were held with members of the University Board, and one focus group comprised by the IT staff working in the academic departments, was conducted. A list of IT staff members was requested from academic departments. Ten IT staff members were randomly selected and invited to participate. Seven IT staff members participated in the focus group.

Procedure of Analysis

Two sets of data were organized for analysis. The first data set consisted of data collected from the focus groups comprised by willing professors, unwilling professors, and those taking part in activities of professional development. This data was used to explore and delineate the professors' activity system in the teaching practices with technologies as a mediation tool. Moreover, the analysis is oriented to explore the discursive manifestations of secondary contradictions between professors and the members of the community. The theoretical framework supported the creation of categories. All components of the activity system -subject, object, tools, rules, community and division of labor- were used as categories of analysis. Moreover, the tensions between professors and the members of the community were defined as another category of analysis and are the ones cited in this article. The analysis of the members of the community revealed recurrent mentions by professors in which they pointed at the University Board and IT staff as relevant actors that affect their ICT adoption.

The second part of the analysis was conducted with the data set comprising the data collected from the interviews held with the University Board and the IT staff focus group. The components of the activity system were the categories of analysis that aim at outlining the primary activity system of both the University Board and the IT staff.

The analysis showed a potential mutual influence as well as opposing positions between professors and other actors participating in the process of technology adoption for teaching and learning. Similarly, the University Board and the IT staff identified both professors and other institutional departments as affecting their work with the promotion of ICT integration in the educational institution. The reciprocal criticism evidenced in the data resembles the dialogue between the actors. A sort of virtual conversation is the form of representation selected for this article. The purpose is to evidence the opposite positions of professors as regards the members of their community, which results in potential tensions and contradictions. The framework of discursive manifestations of contradictions is useful to show the possible existence of contradictions between the professors' central activity and other actors' activities. The study does not conduct a quantitative analysis of discursive manifestations of contradictions. Conversely, it uses the framework to evidence the existence of manifestations and the potential of contradictions as challenges that professional development must address in the integration of technology.

Data Analysis and Findings

Dialogue between Willing and Unwilling Professors to Adopt Technology

The analysis revealed the existence of opposite views regarding the adoption of ICT among professors. Professors that are willing to use technology have positive thoughts, and they act in consequence. The unwilling professors have the opposite opinions and actions. When differences in beliefs and actions to some extent disturb the academic or personal interests of the other party, then conflicts come to the surface at the department level. The unwilling professors become an obstacle for department initiatives of integration. The conflict of interests between professors ends up in a state of departmental inertia or inattention. Therefore, the adoption remains at the individual level of those willing to use technology.

Processes also have effects in the opposite direction. Willing professors encourage department integration (Castro, 2016), which affects the comfort zone of unwilling professors. The opposite direction in beliefs and actions regarding technology adoption is a potential habitat for contradictions between professors. For some professors, there are dilemmas regarding the possibility of modifying the curriculum, and they consider such changes as large and unenforceable. Professors in favor of adopting technology face a constant negativity from some colleagues, which affects ICT integration. Such a negative attitude in reluctant professors leads to a critical conflict with those in favor of technology, hence the latter end by adopting a passive attitude led by the decision to avoid confrontations.

Dialogue between Professors and the University Board (UB)

On one hand, according to the University Board (UB), the intention of professors to use technology is a decisive factor to create the necessary conditions for adoption of Information and Communication Technology. The UB is, in their own thoughts, responsible for overcoming professors' external barriers such as the lack of technological resources and the lack of professional development. The UB acknowledges such role. However, it changes at the achievement and practice levels. From the UB point of view, their responsibility in ICT adoption is well accomplished and once the infrastructure is there, the responsibility of integration falls upon the academic departments and professors. On the other hand, professors consider that the development of some conditions, for instance the network infrastructure, is not sufficient for developing their work with technology.

The discursive manifestations of contradictions come in the form of dilemmas. According to the UB members, they properly fulfill their responsibilities. However, statements such as "but everything can fall [in a vacuum] if people [professors] do not push", evidence the dilemma they face with professors, by putting the next responsibility on professors' shoulders. Conversely, professors believe that the UB is not fulfilling its duties. Professors express the opposition to the UB in the form of conflicts or critical conflicts, evidencing levels of resistance, disagreements, and criticism. As a result, professors offer resistance, for instance, by refusing to use technology. The opposition to the UB's point of view takes also the form of a double bind through rhetorical questions about the orientation of institutional investments and the political discourse related to such investments, which professors find both unacceptable.

Furthermore, statements such as "we invest one million and everyone applauds. Hey, look, we spend a million!" were articulated using the form of sarcasm to emphasize their critics. The irony is not in Engeström & Sannino's (2011) framework. However, it can be a powerful manifestation or disagreement evidencing potential contradictions. Further research is necessary in this regard.

The Dialogue between Professors and the IT Department Staff

The lack of technical support is a recurrent barrier in literature. The IT staff, both at the department and at an institutional level, is considered as a limitation for professors' adoption of technology. Professors argue that the profile of the IT staff is not well suited to support adoption. The IT staff's current profile is oriented to offer assistance in technological issues, and they do not have the required pedagogical and soft skills to offer a proper support.

However, when the IT department staff refers to their experience in supporting technology adoption by professors, they see the problem in the opposite direction. For them, the limitations lie in the professors' fear of technology. IT staff admit that professors need their support, but such has become a negative dependency-relation.

Professors demand from IT staff a deep level of knowledge in many fields as well as available time for assisting them in their requirements. From the IT staff's point of view, the required diversity of knowledge and available time are limitations for supporting professors and they cannot solve the necessities alone. Instead, they depend on higher levels of authority, other institutional departments, or institutional rules that affect their tasks completion. Professors stated that the profile of the IT staff was incompatible with the task of supporting professors' needs of ICT integration in curriculum. Expressions such as "yes, but" were used to explain that members of ICT staff have the wrong profile. The dilemma for IT staff was about the real possibilities of supporting professors versus the dependence on third-party departments or department authorities. In some cases professors identified feelings of frustration regarding the ability of IT staff to meet their needs. The conflict became evident when professors asked for support and received negative answers from the IT staff due to, for instance, lack of time.

Discussion on Challenges of TPD-ICT

A Collective and Cross-level Development

The study evidences that the integration of technology for teaching and learning purposes is not an individual activity. Even though some researches focus on the individual level of professors' attitudes towards technology (Salleh, 2016), other highlight the importance of not only helping overcome professors barriers but also enabling organizational conditions (Castro & Nyvang, 2018).

Even at the classroom level, the complex combination of internal factors in teachers and external conditions at the institutional level influences ICT adoption. Efforts to integrate technology can be hindered by sets of rules, or other individuals or groups. Rules and professors' community members are not necessarily at the same institutional level as professors. Instead, they are somewhere else on the vertical structure of the organization. Unwilling professors towards ICT adoption, students,

and the university board are examples of professors' community members that are at the same level, below, or above, correspondingly. The institutional landscape of ICT integration becomes more complex when every member of the community is, at the same time, affected by other guidelines and other community members. For instance, both types of professors -willing and reluctant to use technology- share that the primary goal of their practices is the students' learning. However, both types of professors approach such a goal in different ways, with different tools and affected by different rules and other community members.

As the analysis transcends the vertical organization levels, misalignments in the goals of the activities are an evident limitation. For instance, the willing professor aims at using technology to improve students' learning. However, the university board seeks to promote the uses of technology to accomplish institutional policies. The university board fails to understand both the professors' difficulties in this domain and how to close the gap. Indeed, the area of coincidence regarding the goal of the activity between professors and the university board is small. According to Sporn (1996), the ambivalence of goals, objectives, and standards in teaching and people with different agendas from the top to the bottom levels of the university are characteristics that need to be better understood. It is suggested that TPD-ICT requires reaching a broader scope of development. It becomes essential for TPD-ICT to attend a collective cross-level approach to teaching with ICT. In other words, to move from a teacher-centered professional development, to an organizational development that deliberately aims at engaging or re-engaging a diversity of participants with a variety of goals, and from that to the achievement of results. Noticeably, such orientation will, perhaps, increase the levels of complexity of professional development initiatives.

The study highlights the mutual dependency among professors and other actors to successfully integrate technology, which highlights the importance of TPD for ICT in order to surpass the professor-centered approach. To face such complexity, TPD requires embracing an alternative unit of development focused on changes in the goal to be achieved. A collective unit of development aimed at triggering changes in the goal of the activity encompasses the potential development of the participants in the professional field (Engeström & Sannino, 2010). In this regard, professors acknowledge students' learning as the goal of their teaching practices. In principle, this goal of teaching matches the outcome of the professional development of changing the learning outcomes of students (Guskey, 2002). However, Engeström & Sannino (2010) conceptualize objects or goals of human activities as *runaway* entities. The malleability in the goal of the activity is also evident in the study when the aimed goal to participate in professional development activities goes from the changes in students' learning to increasing salary, to improving students' evaluation, and to showing knowledge in the field.

Barriers as Bridges to Overcome Boundarie

The university professors and other institutional actors related to the ICT integration have opposite views on the origins of problems, solutions, and on the role of those responsible of providing the answers. Problems do not follow one exclusive direction. Conversely, they can be multi-directional, depending on the actors involved. For instance, when willing professors pointed at the IT staff as an obstacle, the IT staff voices laid the blame for lower levels of adoption on professors. The three dialogues in the analysis section evidence the opposite view between professors and other members of their community. Both sides are mutually affected.

The analysis of discursive manifestations of contradictions supports the idea that opposite positions are signals of potential contradictions. Making dilemmas, conflicts, critical conflicts and double binds evident, is an approach that can be appropriated by TPD-ICT in order to overcome the barriers of ICT adoption and integration. Kennedy (2005) states that transformative models of professional development are not free of tensions; they rather rely on tensions. Transmission and transitional models of TPD (Kennedy, 2005) follow a linear model of development of skills in order to either overcome or eliminate barriers instead of exploring barriers to develop the activity. Within traditional frameworks, external barriers for ICT adoption and integration are challenging to address as regards professional development. Conflicts can arise due to collective participation. A significant challenge to be addressed by TPD-ICT is to take advantage of problematic situations as the starting point for achieving solutions; not intending to reduce limitations but to foster the appearance of new barriers and build upon constraints instead. As shown in the study, the limitations are seldom exclusively within the boundaries of an individual. Instead, solutions require crossing the others' domains.

The Cultural Appropriation

Cultural and social factors have been suggested as barriers for ICT adoption. According to Shahadat et al. (2012), the lack of mastery of the English language is a cultural and contextual limitation for teachers' adoption of ICT in Bangladesh. Hew & Brush (2007) highlighted the fact that limitations related to the subject's culture and pedagogy -as the set of institutionalized practices associated with a particular area of study-, are also constraints.

The study revealed that both the integration of ICT and the TPD initiatives are affected by culture in the shape of formal or informal rules. Moreover, institutionalized and accepted practices related to the distribution of work responsibilities are difficult to change. Changes are even more difficult due to the particular contexts and culturally rooted practices, which influence professors' beliefs.

The study also highlights the need of profound changes in collective and individual practices and at the different levels of the educational institution. Individual and organizational beliefs regarding the use of technology must be one of the aims of professional development. It is proposed that the development of organizational tools can transform *why* and *how* students are learning with technology. It is necessary to foster methods to facilitate participants' internalization and externalization as ways of altering cultural practices.

It is not enough to consider culture or context as a crossing element of TPD for the ICT curriculum. Instead, a cultural development of the academic and IT department staffs as well as of other groups is desirable. It is also essential for the different social actors to foster *agency* in culture in order to decide the way they want to change regarding this cultural issue: technology across culture, or technology in co-existence with other cultures. According to Bell (1972 in Halas, 2010), culture consists of processes of creation of individual and collective activities. Moreover, Zander (2007) highlights that culture is not only present in how humans see the world, but also in the way artifacts are created and when they are used. Culture is then two-fold; shaped by the mind and actions of individuals, and also a shaper of the minds of individuals (Bruner, 2009).

The interaction between the inner self of individuals and the external formation of culture must be properly addressed by TPD. An improvement in the university practices regarding the use of technology for teaching and learning purposes will be addressed to the extent that institutional multi-cultural changes are considered. According to Petty, Beadles, Lowery, Chapman & Connell (1995), organizational performance is linked to organizational culture.

According to Dirlik (1987), culture is not only a way of seeing the world but also a way of making and changing it. As an expected outcome, professional development must include the institutional cultural development and transformation regarding the uses of technology, as a way of creating and changing culture. According to Virkkunen, Vilela, Querol & Lopes (2014), transformation implies a new logic of development, not a change that stops evolving once achieved. A new logic of development implicitly means doing things in different ways, a need to build new tools, or the reconstruction of existing activities, and not just aesthetic renovations that remain in an intact goal. Professional development has the challenge of not only reconstructing the way students learn with technology, but the way professors and the institution learn to discover their own limitations and produce solutions and, moreover, the way they learn to produce enduring and sustainable results.

The Relations of Power

In Foucault's (1982) approach to power, given that human subjects are immersed in relations of production and significance, they are engaged in relations of power. As a people-oriented institution (Sporn, 1996) with a diversity of goals and interests –either at an individual or collective level-, a university is strongly affected by relations of power. Specifically, universities are complex organizations (Sporn, 1996) that should be understood from their relations of power (Foucault, 1982). As mentioned before, the integration of technology for learning purposes is not an isolated activity. However, the list of participants in the activity is not exhaustive. On the contrary, the actors and levels of participation are different from one department to another, from one university to another. Moreover, as the relations of power are a set of actions upon other actions (Foucault, 1982) or actions of others, there are particular forms of how the actions modify the forms of power relationships.

According to Marginson (1997), the relations of power can produce both positive and negative effects. Furthermore, what is positive for someone may not be positive for someone else. For experienced professors in the use of technology, the problem lies in the existing relation of power with coordinators of initiatives of ICT integration. Should the level of knowledge and expertise of the professor be higher than that of the coordinator, the relation of power may have adverse effects. According to Marginson (1997), in the relation of power people remain free of direct coercion. This freedom is more evident among academics in universities in the form of the autonomy referred to by Sporn (1996); an autonomy that creates difficulties in the coordination of initiatives "for governing and managing the University" (p. 42). As discussed before, the collective and multi-level nature of initiatives for ICT integration evidences the need to pay attention to TPD-ICT in order to cover conflicts caused by relations of power that can hinder ICT integration and adoption. Indeed, professional development itself is not free of relations of power. The "collection" of courses and hours of training is, for some professors, a form of showing knowledge in the topic and exerting or resisting power.

Similarly, the absence of training in ICT can put professors in a position of disadvantage within the relation of power. The complexity of relationships of power in the integration of ICT and the initiatives of professional development for its adoption must be deeply studied. However, a fundamental challenge for TPD towards ICT is to address both forms of relations of power. The directed offers and traditional methodological forms of training for ICT adoption do not favor the addressing of this challenge. A limited offer is, in fact, a form of coercion.

In some cases, there is no option for professors to choose what is adequate training.

The process of making sense and obtaining benefits from training is difficult. The challenge for TPD-ICT is, then, to promote a reflection and collaboration among professors to find out the most accurate forms of development, according to contextual needs.

Conclusions

The present study aims at contributing to solve the contemporary challenges of TPD to overcome the boundaries of ICT adoption and integration. While literature reveals that current conceptualizations of TPD are teacher-centered and that efforts are placed in the development of professors as the essential agent to transform education, the study suggests as follows:

1. The adoption of technologies for teaching and learning is a collective task rather than an individual endeavor. Collectivity refers to the influence handled by other human actors, cultural rules, and artifacts that influence a successful adoption and integration at different levels of the institution.
2. The concept of barriers as something to be eliminated must be transformed in order to understand limitations as contextual restrictions working as vehicles for the development of solutions. The dichotomy between internal and external barriers must be surpassed.
3. Special attention must be paid to the cultural appropriation and attainment of technologies for learning as a means for institutional transformation.

These ideas can be essential in the construction of a broader approach to professional development. If limitations toward technology adoption come from all levels of the educational institution, the ways for the solution must include such levels. It is too ambitious to continue fostering professors' learning if they are not able to solve external limitations and if the actors responsible for solving external limitations do not share, at least partially, the same interests. Some researches highlight similar findings (Abdul Razzak, 2013). However, initiatives remain individually focused.

Upon the analysis of the challenges of the professional development of ICT integration in education, an organization-oriented development approach is proposed to adopt information and communication technology (OOD-ICT) as an alternative to carry out further exploration. A pivotal concept is the collective unit of development. It moves TPD from a teacher-centered approach as the unit of development to the integration of –at least- two actors in the process of intervention in the horizontal and vertical levels of the organization in order to surpass the boundaries affecting the possibilities of integration. The proposed model can be categorized as transformative from the perspective of integrating various stakeholders into the debate (Kennedy, 2005).

If we take the case of UNA as an example, Figure 1 depicts in a simple way the institutional structure in its vertical and horizontal dimensions. The classroom is the first level in the educational organization. The professor and the students are the essential components at the classroom level. At the academic department level –mathematics or chemistry, for instance– there is coexistence among the management Head of Department (HoD), the administrative staff, and the academic sub-organizations. The next level is the faculty level, for example, the Faculty of Social Sciences. The faculty groups academic departments and administrative staff and deans. The following level of middle management is a complex framework of administrative departments supporting academic, administrative, and student-related work of faculties and academic departments. Finally, the higher level of management includes, for instance, the University Board and the University Council.

The ellipses in the model show the potential collective units of development in organization-oriented development. The units of development can include participants from within an institutional layer, as shown in UD1. Crossing layers, as in UD2, or a combination, as in UD3.

Figure 1. A view of organizational-oriented development for ICT integration and adoption
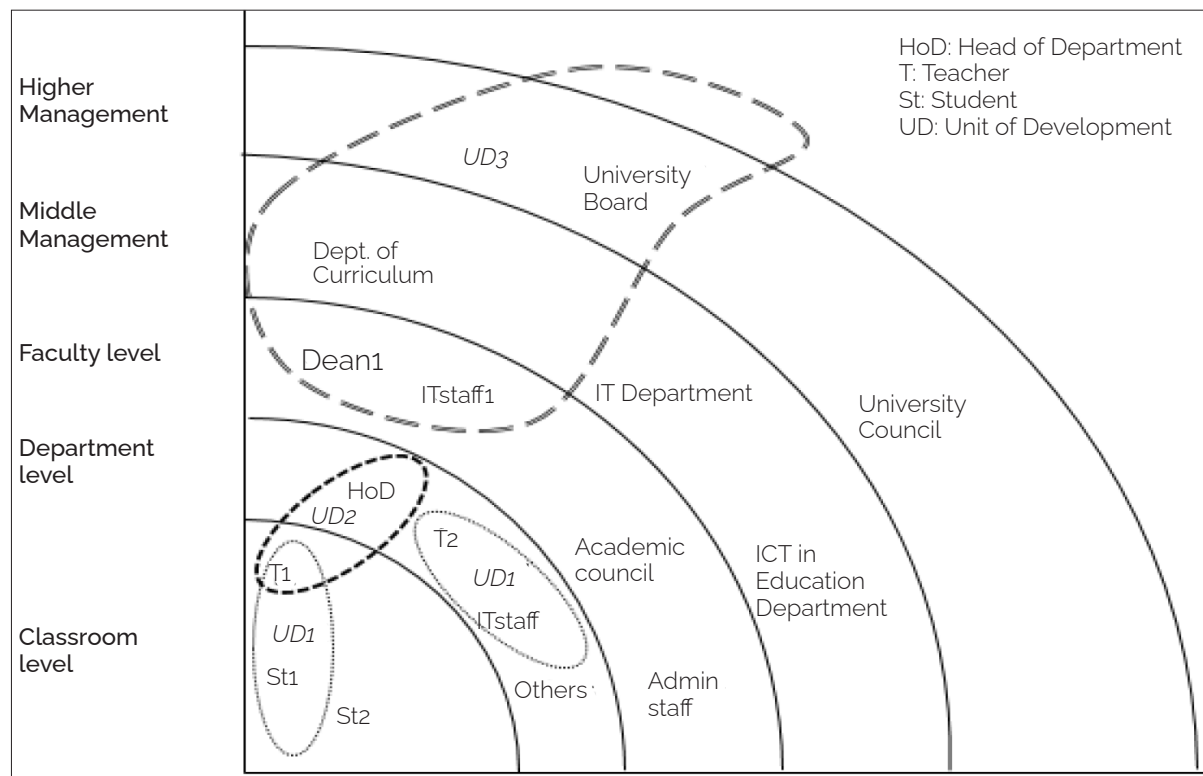
Briefly explained, the unit of development 1 is formed by the professor and the students as the participants, at the same level; the classroom. That can be called *a collective in-level unit of development*. The unit of development 2 is between professors and the Head of Department as a *cross-level unit of development*. Finally, the unit of development 3 is formed by a Dean and IT staff at the Faculty level, together with the institutional department of curriculum and the University Board. UD3 can be called *an expanded unit of development*.

The model is an initial conceptualization of professional development to overcome the current challenges of professional development for ICT integration. Transmission and transitional models of teacher professional development (Kennedy, 2005) have pointed primarily at teachers' adoption as a means for institutional integration. However, the proposed model follows the logic of collective development of solutions to promote individual adoption and institutional integration. Further research is needed to put the model into practice and analyze its potentialities and weaknesses.

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