THE INDIVIDUAL INNOVATIVENESS THEORY: A FRAMEWORK TO INVESTIGATE TEACHERS' VIEWS ON TECHNOLOGY

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Abstract

This paper has two objectives: to briefly describe the Individual Innovativeness Theory and the five adopter categories and to show how it was used in a mixed methods study that investigated the integration of technology in the classroom of Modern Languages courses in the state of Paraná, Brazil. The theory was used to select participants for the qualitative phase. Results showed that by focusing on the adopter categories it is possible to establish new strategies to improve technology integration in the classrooms and long-term planning. They provided a good starting point to understand teachers and their relationship with technology.

Introduction

Several researchers have been studying the impact of technology and its relationship with education (Lawless & Pellegrino, 2007; Zhen, 2008). Higher education institutions, especially in developed countries, regularly use information and communication technologies (ICT) in their courses (Anderson, Varnenhagen, & Campbell, 1998; Zhen, 2008). Educational institutions have made high investments in technology (Zayim, Yildirim & Saka, 2006).

The impact of technology on teaching and learning has been perceived in all fields of teaching and numerous evidences and works show the potential benefits to the teachers who carefully integrate it in their classrooms. Consequently, the integration and use of technology has been the goal of many educational institutions (Zhen, 2008).

Since the early 1980s computers have been expected to transform traditional education. However, despite the potential of technology and all the research and evidence that it is being increasingly used by teachers, (Lawless & Pellegrino, 2010) the diffusion of technological innovations for teaching and learning has not been generalized or deeply integrated by the curricula (Zayim et al., 2006).

More than three decades later transformations in educational practices have not yet taken place, and the fact that integration did not happen in the expected way is one of the mysteries of contemporary educational practice (Karasavvidis, 2009). Technology integration in education is still a problem with no definitive answer.

There are many reasons why innovative technologies have not been widely integrated into teaching: lack of equipment, of technical support for teachers, of training, of accessible models for change to take place, of funds from the institutions, of time; technology problems; and resistance to change by teachers; among others (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012; Karasavvidis, 2009; Vrasidas & Glass, 2007).

Despite the several reasons mentioned, the key factor pointed out by several researches, is the teacher (Chen, 2008; Zayim et al., 2006). The teacher is the guardian of technology, the one who not only determines what goes into his or her classroom, but also who is responsible for how it is used in the classroom (Zhao & Tella, 2002). This does not mean that the teacher is responsible for the lack of success in implementing changes in education. That would be a simplistic way of approaching the issue. However, the perspective of this professional has proven to be valuable for studies that focus on integration and seek a deeper understanding of the phenomenon.

The teacher's decision to integrate or not technology, in turn, is also affected by several factors: age, teacher education, attitudes, beliefs, among others. Understanding teachers' relationship with technology is, for this reason, in many senses, one of the keys to understanding technology adoption.

Although the Foreign Language (FL) teaching area is one of the only areas of study that has a specific field to study its relationship with technology – Computer Assisted Language Learning (CALL) – the situation is not different from other areas in education, and integration has not occurred as expected. In general, technology is of secondary importance in classroom settings, being used to provide additional activities or complement instruction. True and meaningful integration is still in its early stages in several educational institutions (O'Bryan & Hegelheimer, 2007).

CALL/ Technology is still an innovation in the language area in various contexts and for language teachers in several parts of the world (Carless, 2013; Van den Branden, 2009). This is the situation in different settings in Brazil, where the integration of CALL remains at the very beginning stages (Barsotti & Martins, 2011) in many parts of the country[1].

A mixed methods study was then conducted to investigate technology integration in the classroom of Modern Languages courses in the state of Paraná, Brazil. The objective was to analyse the factors that determine technology integration from the point of view of teachers and in the context of higher education. The focus was on this specific group due to the central role they play in the education of future language teachers.

It is important to mention that there are no specific or comprehensive frameworks or models in the CALL field to study the integration of technology in the classroom by FL teachers (Hong, 2009).

This paper will briefly describe this study and its main results. Then, it will focus on Rogers' (1995) Diffusion of Innovations Theory and its sub-theory

the Individual Innovativeness Theory that was used to select participants for the qualitative phase of the study. The use of this theory proved to be useful to develop new strategies to improve technology integration in the classrooms and long-term planning.

The Study

Since integration is a complex issue, the option was for a mixed methods study that would provide a comprehensive picture of all the questions approached and a deeper understanding of the teachers' views. Rogers' Diffusion of Innovations Theory (1995) and Hong's Spherical Model of L2 Teachers' Integration of CALL Technology into the Classroom (2009) were the theoretical and analytical models that respectively guided the research. Hong's model considers that there are three sets of factors that represent the essence of this integration: CALL technology education, teachers' individual factors and contextual factors.

This mixed methods study adopted a sequential explanatory design that consisted of two distinct phases: a first phase with a quantitative approach and a second phase with a qualitative approach. The final inferences were made from the results of both phases of the study. Analytically, the use of technology in the classroom was not considered a unitary construct, but rather multifaceted. Contextually, different educational institutions, not just one or two universities, were investigated. The purpose was to avoid methodological, analytical and contextual constraints commonly found in studies on the integration of CALL.

For the first quantitative phase a questionnaire was developed to collect data. The instrument was validated by a panel of experts, tested in a pilot study and, finally, applied to a sample of 152 teachers from 33 Modern Languages courses from public and private institutions throughout the state of Paraná. Statistical analyses were performed to examine the relationship between the three sets of factors from Hong's Spherical Model and the multifaceted uses of technology by the teachers of undergraduate language courses in Paraná.

The results concerning technology identified four different uses: (1) Technology for Delivering Instruction (TDI); (2) Technology for Class Preparation (TCP); (3) Teacher-directed Student use of Technology to Perform Tasks (STPT); and (4) Teacher-directed Student use of Technology during Class Time (STCT). Results also showed the influences of individual factors, contextual factors and prior CALL/ICT education on the uses of technology. Individual factors and contextual factors were identified as important predictors of CALL/ICT integration.

Participants were then selected for the qualitative phase according to the results of the quantitative phase and to Rogers' Individual Innovativeness Theory. Sixteen semi-structured individual interviews were conducted. The qualitative phase deepened the quantitative results and explained the unexpected results and the results that could not be answered in the quantitative phase.

The integration of the results showed that in addition to individual and contextual factors, apparently prior CALL/ICT education should not be dismissed as a predictor of CALL/ICT integration. It was also possible to provide a clearer picture of CALL in the Modern Languages courses in the state of Paraná.

This research on the integration of CALL in the Brazilian context sought to contribute to a broader understanding of CALL and to show ways for integration to take place in other contexts. In the next sections Rogers' (1995) Diffusion of Innovations Theory will be explained as well as the Individual Innovativeness Theory.

The Diffusion of Innovations Theory

Rogers' (1995) Diffusion of Innovations Theory is one of the main theories that try to explain the process of change and the adoption of innovations in several fields and professions (Anderson et al., 1998; Stanley, 2012). Various authors recognize it as the most comprehensive work in the area, and it has been extensively used as a theoretical framework in studies on innovations (Albirini, 2004; Keengwe, Kidd, & Kyei-Blankson, 2009).

Rogers (1995) defines diffusion as "the process by which an innovation is communicated through certain channels over time among members of a social system" (p.10). According to the author, there are then four main elements in the diffusion of innovations:

1. The innovation – "An idea, practice, or object that is perceived as new by an individual or other unit of adoption." (p.11).
2. A communication channel – "The means by which messages get from one individual to another" (p.18).
3. Time – This refers to the innovation decision process (from knowledge to adoption or rejection), to the innovativeness of the individual (how early or late he will adopt the innovation), and also to the innovation's rate of adoption.
4. The social system – The social context where innovation diffuses.

An innovation then is related to the perception of the user. This is what decides the newness of an innovation. As to communication channels, studies show that most individuals rely on the opinion of near peers who have adopted the innovation rather than on the opinion of experts. Thus, diffusion is a social practice.

Rogers' (1995) Diffusion of Innovations Theory is made up of several sub-theories or interrelated theories. Each of them focuses on an aspect of the diffusion process. According to Albirini (2004) and Surry (1997), the most widely used of them are:

1. The Innovation Decision Process Theory
2. The Individual Innovativeness Theory
3. The Rate of Adoption Theory
4.   The Perceived Attributes Theory

The Individual Innovativeness Theory
According to this theory, some individuals are more innovative than others and for this reason will adopt an innovation earlier than the majority of the group. That is, some individuals have more or less of innovativeness than others. It is a continuous variable that is separated into categories, essentially a conceptual design. Rogers (1995) states that there are five adopter categories: (1) innovators, (2) early adopters, (3) early majority, (4) late majority, and (5) laggards. The values and the dominant characteristics of each category, according to Rogers (1995), are summarized below:

1. Innovator (venturesome)
   - Adventurous, eager for new ideas, risk taker.
   - Controls considerable amount of financial resources to absorb possible losses due to unprofitable innovations.
   - Disposition to accept occasional setbacks when an innovation is unsuccessful.
   - Ability to understand and apply complex technical knowledge.
   - Capacity to deal with a high degree of uncertainty about an innovation.
   - Plays an important role in the diffusion process: launches the new idea in the system.
   - Gatekeeping role in the flow of new ideas.
2. Early adopter (respect)
   - More integrated part of the local system: localities.
   - Greatest degree of opinion leadership in most systems.
   - Speeds the diffusion process.
   - Not too far ahead of the average individual in innovativeness: serves as a role model.
   - Embodies successful use of new ideas.
   - Makes judicious innovation-decisions.
3. Early majority (deliberate)
   - Adopts new ideas just before the average member of a system.
   - Interacts frequently with peers.
   - Rarely holds positions of opinion leadership in a system.
   - Important link between the very early and the relatively late in adoption.
   - Relatively longer innovation-decision period than the innovator and the early adopter.
4. Late majority (skeptical)
   - Adopts new ideas just after the average member of a system.
   - Adoption is the result of economic necessity and/or pressure from peers.
   - Approaches innovation skeptically and cautiously.
   - Adopts only when most others have adopted an innovation.
   - Adoption only happens when uncertainty is removed, has to feel safe.
5. Laggard (traditional)
   - The last to adopt an innovation.
   - No opinion or leadership.

- The most localite.
- The reference is the past.
- Interacts primarily with others who also have relatively traditional values.
- Suspicious of innovations and change agents.
- Relatively lengthy innovation-decision process;
- Rational resistance to innovations: limited resources.

These categories are based on abstractions from empirical investigation. They are ideal types, that is, conceptualizations (Rogers, 1995). The innovativeness continuum cannot be broken into clear parts and exceptions can be found. However, the summary above gives a useful starting point to make a distinction between adopters using Rogers' (1995) categories. In diffusion research Rogers' method of adopter categorization is the most widely used (Mahajan, Muller, & Srivastava, 1990; Rogers, 1995). Although some information is lost by grouping individuals, its main advantage is that it is a simplification that helps the understanding of teachers' behavior.

Adopter categorization based on innovativeness. Considering an adopter population, the distribution of the five categories population typically follows the well-known bell-shaped curve. Adoption is plotted over time on a frequency basis (Rogers, 1995). By using a diffusion curve it is possible to compare the innovativeness of an individual with other members of a system. According to several authors (Butler & Sellbom, 2002; Mahajan, et al., 1990; Rogers, 1995; Wilson, Sherry, Dobrovolny, Batty, & Ryder, 2001), the spread of each category is approximately as follows:

- Innovators: 2 – 3%
- Early Adopters: 13 – 14%
- Early Majority: 34%
- Late Majority: 34%
- Laggards: 16%

The use of adopter categories relies on labels, and this can be problematic. However, they are also powerful markers of meaning (Wilson et al., 2001). Rogers' (1995) classification model based on innovativeness to describe the adoption patterns of individuals in a group has a series of advantages. Mahajan, et al. (1990) highlight the following: ease of use; it offers mutually exclusive and exhaustive standardized categories, by which results can be compared, replicated, and generalized across studies; and because the underlying distribution is assumed to be normal, continued acceptance of an innovation can be predicted and linked to the adopter categories.

According to Wilson et al. (2001), "The idea that people fall on a receptivity continuum seems to have some empirical support, and can help us think about adoption in terms of meeting individuals' needs" (p. 299). The adopter categories can also be used for *audience segmentation*, "a strategy in which different communication channels or messages are used with each sub audience" (Rogers, 1995, p. 275). And this is another valuable aspect of this categorization.

How the Individual Innovativeness Theory Was Used in the Study
To classify respondents into the five categories the individual innovativeness scoring procedure developed by Anderson, et al. (1998) was used. The data that teachers provided for Part 3 of the questionnaire (Digital Literacy) was used, and a composite score was calculated for innovativeness by summing the level of self-reported expertise indicated for each of the 26 statements of that section. All the 26 items started with "I can ..." and the possible answers were 1 for totally disagree, 2 for disagree, 3 for does not agree or disagree, 4 for agree, and 5 for totally agree.

The presumption was that for an individual to "totally agree" with his/her expertise with a certain tool, it probably meant that he/she adopted this tool relatively earlier than an individual who rated his/her knowledge of use of a certain tool as "totally disagree." The total possible cumulative score for innovativeness was 130 and the lowest was 26. Sample scores ranged from 39 to 130, and when plotted resembled an S-shaped curve which lent confidence to the assumption of normality. Nevertheless, the Anderson-Darling test was also used to verify the normality, and the result showed that the distribution was normal.

Rogers' (1995) adopter categories and individual innovativeness scores were used to classify how many of the sample were innovators, early adopters, early majority, late majority and laggards. The statistical procedures were applied to the total score. The percentages of each category were applied to the number of participants and the results were the following:

- Innovators – 3% (n=4) – the teachers who had the highest scores in the summative scale
- Early Adopters – 14% (n = 21)
- Early Majority – 34% (n = 51)
- Late Majority – 34% (n = 52)
- Laggards – 16% (n = 24) – the teachers who had the lowest scores in the summative scale

Based on the distribution of the participants into these categories, 16 teachers were selected to participate in the second phase of the research, the qualitative phase. In addition to the criterion of individual innovativeness, it was also necessary that the teacher volunteered to participate in the second phase when he or she answered the questionnaire in the first phase.

The final sample consisted of 16 teachers. In total, 16 interviews were conducted with: 1 Innovator, 2 Early Adopters, 5 teachers of the Early Majority category, 4 teachers of the Late Majority category and 4 Laggards. The attempt was to maintain a proportion similar to that of the theory, but the focus was to listen to the voice of the majority – the mainstream faculty (Geoghegan, 1994) – that is composed of members of the Early Majority, Late Majority and Laggards. Teachers from 12 different educational institutions (3 private, 2 federal (public) and 7 state (public) were interviewed. They were located in 8 cities in the state of Paraná: 4 teachers from the capital and the rest from 7 cities in the countryside. In 3 institutions there was the case of 2 teachers from different categories of adopters.

Results

The use of the Rogers (1995) adopter categorization showed that it was possible to observe patterns in the CALL integration process in the context of the study. Individual initiatives that promote the use of technology were observed mainly in two participants, one from the Innovators category and another from the Early Adopters category. They stood out from the others in terms of the uses they made of technology and the perceptions they had of this dimension. A third participant in the Early Adopters category also showed characteristics of this category, but time constraints affected the integration of CALL in his/her practice. Rogers (1995) explains that there is a tendency to reverse the adoption process if explicit difficulties arise.

The four respondents in the Laggards category showed several traits of this group, but in one case it was possible to see how the influence of another teacher affected this categorization. According to Rogers (1995), diffusion occurs over time, but the system has a direct effect on diffusion through its norms and other qualities and also indirect influence through its individual members, which was what occurred in one of the institutions. Participant E10 (Innovator) exerted influence on the other professors of his/her institution encouraging the use of technology by the other professors of the Modern Languages course, including participant E4 (Laggard). This participant showed that he is probably no longer in the category in which he was categorized when he answered the questionnaire.

As for the participants in the Early Majority and Late Majority categories, it was also possible to observe several dominant characteristics of each category. However, it was noticed that at least one respondent in each category did not exactly fit into that category. But Rogers's categories of adopters (1995) are ideal types and the author explains that exceptions are found and there are also no clear boundaries between the five categories.

The context, however, can also affect categorization, as participant E7 explained. According to him/her, his/her questionnaire responses were given when he/she worked in an institution that had many technological resources, completely different from the institution at the moment of the interview. He/She believes that this affected his/her responses and if questioned then he/she might have been ranked in a different category, probably a less innovative one.

The use of Rogers's Theory of Diffusion of Innovations (1995) and its sub-theories in the study was not to accurately determine the categorization of the participants or to determine the factors affecting the integration of technology, but rather to have a better understanding of this process based on the characteristics of the teachers interviewed in the qualitative phase.

However, it was possible to perceive the presence of some dominant characteristics of these categories in the participants. And it was also possible to relate the four uses of technology to the five categories. The Innovators and the Early Adopters were those that showed more involvement and more frequent uses of the four dimensions. They were exceptions when compared to

the other participants. Despite one exception or another, the voice of the majority, that is, the Early Majority, the Late Majority and the Laggards, showed to be convergent, and they corroborated the results of the first phase.

It was possible to observe that the individual characteristics of the adopter categories can be used to focus on how to improve and integrate the uses of the four dimensions of technology. Adopters from each category have different characteristics and different needs when integrating technology. The biggest differences are noticed in the extremes of individual innovativeness, and it is necessary, therefore, to have different approaches to meet the needs of each group.

Final Remarks

By using Rogers' Theory of Innovation Diffusion (1995) in the analysis and interpretation of the results it was possible to see that the degree of individual innovativeness generates standards in the process of CALL/ technology integration. It was also possible to outline some of the individual characteristics of teachers in relation to technology.

The initial intention was not to determine the characteristics of the adopters in detail. However, when we noticed that these characteristics could be observed and categorized, it was seen that it is possible to focus on specific strategies to deal with each group and to meet their needs in relation to technology use, thus increasing its integration. In addition, it is possible to anticipate and focus on specific groups.

One of these strategies is related to the so-called technological climate of institutions (overall teachers' technology education, i.e., the total number of hours that the FL teachers devoted to courses and workshops during their pre- and in-service period divided by the number of teachers in each school).

The report of the influence of the Innovator in one of the institutions showed the importance of the technological climate (Hong, 2009) in the context of the study. Universities or course departments could identify the Innovators and Early Adopters so that their motivation and abilities would influence other language teachers and changes could occur. But this should not be the only strategy since it is very fragile. The example of one of the participants who, because of lack of time could not make greater use of technology, endorses this. But, together with other procedures, it can help a more effective integration of technology.

The responsibility for integrating technology, then, should not be only the teachers', even if they are Innovators or Early Adopters. Institutions should provide conditions for teachers to work using technology, and this includes not only infrastructure, but also time. The first steps to integration can begin in the departments, but the joint movement of departments, teachers and institutions in general is likely to be more successful than individual initiatives.

By explaining how the Individual Innovativeness Theory was used in the study, the objective was to offer another possible framework to investigate teachers' views on technology. And thus establish new strategies to try to make technology integration a more effective process. The theory provided a good starting point to understand teachers and their relationship with technology and showed that it can provide a theoretical foundation for the field. However, future research could focus in the development of a specific instrument that could be used to measure individual innovativeness, one that could be adopted in different contexts.

Note

1. It is important to point out that this is not the situation in the whole country and changes have taken place since research was conducted. Brazil is a nation of contrasts due to its size and social and economic reasons; however, it is not the objective here to explain such an ambiguous scenario.

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