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Augmenting De Ketele's model for university pedagogy

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Réflexion pédagogique et point de vue critique

Abstract

As higher education undergoes major changes (mass higher education, ICT development, etc.), there is a need for methods and models that can be used to analyze the complexity of university pedagogy. In this paper, De Ketele's model (2010) is used as the basis for two case studies. The objectives are to enrich the "field of university pedagogy" by situating ICT among the components that De Ketele describes. The case studies confirm the necessity of viewing university education as a system. They also enrich the model in three respects, namely: 1) by considering ICT a component unto itself that should be added to the model; 2) by considering educational research a full-fledged component that should be associated with ICT in the model; and 3) by reconsidering the complexity of interrelations between the components. The conclusion is that ICT leads to the pedagogical question, that further research is needed, and that the words "digital" and "pedagogy" must be associated in higher education.

Keywords

Higher education, digital pedagogy, ICT, education research, "augmented" model

Résumé

L'enseignement supérieur connaît d'importants changements ; il devient nécessaire de disposer de méthodes et modèles pour analyser la complexité du domaine de la pédagogie universitaire. Dans cet article, le modèle de De Ketele (2010) est utilisé pour analyser deux cas. Les objectifs sont d'enrichir le 'champ de la pédagogie universitaire' en situant les TIC parmi les composantes décrites par De Ketele. L'analyse des cas consolide la nécessité de considérer l'enseignement universitaire comme un système et elle conduit à enrichir le modèle dans trois directions: (1) en considérant les TIC comme une composante à ajouter au modèle ; (2) en considérant également la recherche en éducation comme une composante à ajouter ; (3) en reconsidérant la complexité des interrelations entre les composantes. La conclusion souligne que les TIC conduisent à la question pédagogique ; que de nouvelles recherches sont nécessaires ; et elle revient sur l'importance du couplage numérique / pédagogie.

Mots-clés

Enseignement supérieur, pédagogie numérique, TIC, recherche en éducation, modèle 'augmenté'

Introduction

Since the late 20th century, higher education has been undergoing a sea change, particularly with regard to the development of information and communication technology (ICT). Until recently, technology was an instrument used to manage the sheer number of students in the context of mass higher education (Albero 2014). However, European institutions are now seeking solutions for the use of ICT in pedagogy further to the Bologna Process (1999), the Lisbon Treaty (2000), and the Europe 2020 Strategy, which lead to expectations from national policies on program quality and the success and employability of university graduates. These external factors are compounded by changes stemming from student demands, some of which concern the quality of teaching programs. For instance, students are less accepting of incomplete or redundant teachings (Peraya, 2015). At the end of their curriculum, they also expect to find a job that matches their university education, in an evolving environment where labor market requirements have become more complex, particularly in terms of skills (Sanchez, 2004). To keep up with these social uses, injunctions, and quality expectations, ICT appears to be an asset in modernizing educational institutions and their practices. Learning outcomes are an increasingly important part of formative assessments (Yorke, 2003) or pedagogical alignment (Biggs, 2003). One trend focuses on improving programs so that they factor in student learning (Nygaard, Højlt, Hermansen, 2008). With a program-based approach (PBA), a collaboratively designed curriculum guides the choice of teaching methods (Lenoir, 2015) and is implemented (S. Johnson & C. D. Johnson 2003; Prégent, Bernard, Kozanitis, 2009), while specific tools are produced and provided to this end (Loisy & Sanchez, 2016). This fragmentation born of university teaching in the digital age calls for a new model that can be used to interpret these factors and their complex interrelations. In international literature, De Ketele's model (2010) of the "*field of university pedagogy*" [in French, "le champ de la pédagogie universitaire"] focuses on higher education teaching and learning and their relation with a range of components, creating a "system with multiple interactions." However, although ICT is among the most important starting points for research and debate on introducing this pedagogical paradigm to higher education, the author does not present it per se in his model. How can ICT be represented in the model? And does introducing ICT lead to other changes in this "system with multiple interactions"?

In this paper, De Ketele's model (2010) is used as the basis for two case studies. The objectives are to enrich the "*field of university pedagogy*" by situating ICT among the components that De Ketele describes. The case studies confirm the necessity of viewing university education as a system. They also enrich the model in three respects, namely: 1) by considering ICT a component unto itself that should be added to the model; 2) by considering educational research a full-fledged component that should be associated with ICT in the model; and 3) by reconsidering the complexity of interrelations between the components. The conclusion is that ICT leads to the pedagogical question, that further research is needed, and that the words "digital" and "pedagogy" must be associated in higher education.

Teaching and learning in higher education, an articulated range of components

For several decades, authors have been attempting to clarify the notion of pedagogy in higher education, especially in North America. For example, Walkner (2006) understands pedagogies in higher education as teaching methods "in the broad sense," including the roles of teachers and students, teacher–learner–curriculum interrelations, and, more generally, the context in which the connection between education and learning takes place. Similarly, Lebrun (2015), willing to avoid a dele-

terious dissociation between the teaching and learning processes, highlights the need to combine pedagogy and technologies and to broaden reflection on the overall construction of training systems. In this relational area, a complex game is unfolding. Identities, the flow of power, mediated knowledge, as well as social and institutional structures interpenetrate the other dimensions. Understood for many years by English-language universities, this broader conception of pedagogy in higher education has appeared more recently in the European context with the "*field of university pedagogy*," a model developed by De Ketele (2010). In developing his model, De Ketele (2010) draws on English-language research as the pedagogical issue has remained relatively foreign to higher education in Europe for a longer time (Albero, 2014). It has spread gradually under the influence of policies, in particular the Europe 2020 Strategy. Teachers are now encouraged to focus on student learning, not just on teaching. This can be likened to a change in what has been called the "educational paradigm" (Barr & Tagg, 1995). Students are encouraged to actively participate in building their knowledge and to develop their autonomy. De Ketele's model (2010) includes five interrelated components and is organized according to two axes (see the dark elements and arrows on Figure 1). On the diachronic axis, *Pedagogical activities* are influenced by the *Curriculum* and then, in turn, influence *Results*. The synchronic axis refers to *External factors* and *Contexts* that are operating on *Pedagogical activities* (teaching and learning), *Curriculum*, and *Results*. The first are political, economic, cultural, and social. The second relate to the academic environment and to students. The model thus emphasizes that the "*field of university pedagogy*" extends beyond the educational dimension (the diachronic axis).

Higher education and ICT

Digitized information and its vectors—the electronic devices that record and process information with various programs—are physically present everywhere at universities: corporate governance, administration, financial management, and even education and knowledge control. Policies favoring ICT instill a change readily grasped by higher education institutions because it enhances their image in a context in which international rankings lead to increased pressure (Stromquist, 2007). Since Cuban's work (2001), technological devices and tools appear to have been introduced mainly to modernize institutions, while their development for educational purposes remains below their potential.

The 13th edition of the New Media Consortium (NMC) Horizon Report (L. Johnson *et al.*, 2016) describes annual findings from the NMC Horizon Project, an ongoing research project designed to identify and describe emerging technologies likely to have an impact on learning, teaching, and creative inquiry in education. Six key trends, six significant challenges, and six important developments in educational technology are placed directly in the context of their likely impact on the core missions of universities. For example, some developments in educational technology for higher education are important in the medium to long term: learning analytics and adaptive learning; bring your own device (BYOD); augmented or virtual reality; and affective computing.

However, educational incentive programs have not been as successful as hoped in improving student learning and the overall system. To overcome this problem, equipment policies—even those that do not emphasize the educational aspect—are coupled with incentive policies that seek to stimulate the use of ICT in educational design. In spite of current advances in the field, the relations between educational and technological matters are still an issue at many universities. Three factors may explain this phenomenon: the traditional academic culture at the institution's core, the status of auxiliary services commonly associated with educational and technological activities, and the latter's subordination to current market and ideological forces. It is urgent that higher education take up the problem and develop a comprehensive line of research (4, 2014).

Two cases are analyzed below to examine De Ketele's model (2010) and determine whether factoring in technology and research holds potential.

Two case studies using De Ketele's model

ICT and learning activities in an auditorium

This first case (Lamine & Petit, 2014) focuses on the educational use of electronic voting systems (clickers) during lectures in auditoriums. It is coupled with a quantitative assessment methodology on the effects of the teaching method on student results. The digital educational activity relates to a training session in which the teacher participated. The session was given by the university's Pedagogical Support Services, a unit found at French universities (Cosnefroy, 2015). A qualitative study was also carried out in order to investigate potential changes to the teaching approach among teachers who took the training. The assessment enables the university's Pedagogical Support Services to measure the effects of the training dispensed. This qualitative study focuses on changes in the teachers' professional development rather than only on satisfaction.

Results show that interactive learning strategies improve students' mastery of concepts and problem-solving skills. Interactivity in the classroom also appears to give students an edge at exams, with effects equal to or greater than such factors as parent education or the number of hours spent studying per week. Students and teachers alike believe that interactive learning strategies improve student learning, and both think these strategies increase student engagement and motivation (Lamine & Petit, 2014; Rudolph, Lamine, Joyce, Vignolles, & Consiglio, 2014).

One author, the teacher who describes his experiment, took the training session because he was driven by questions about his usual teaching activities, which fell short of helping all students acquire an in-depth understanding of physical science concepts, a central element of the curriculum. On the diachronic axis of De Ketele's model (2010), teachers seek to improve student learning by better adjusting their teachings to the curriculum. In contrast, student results drive the new educational activity. Assessments show that student results improved in two regards: their mastery of concepts and their method of learning (Lamine & Petit, 2014).

On the synchronic axis, the academic context both encourages innovation and restricts the latitude necessary for innovation. On the one hand, it promotes educational development by providing training opportunities to all teachers who wish to support student learning. This shows the university's interest in educational issues. On the other hand, this context proves to be an obstacle, since the institution imposes a normative assessment for all students, which contradicts the educational alignment of learning objectives, interactive learning situations, and evaluation processes based on these objectives (Biggs, 1996; 2003). According to the authors (Lamine & Petit, 2014), these constraints can weaken the innovative educational process. These limitations reveal the need to ensure that academic projects integrate actors' innovations; otherwise, the initiative may be considered so dissatisfactory that some will abandon it completely.

The authors of the case study (Lamine & Petit, 2014) point out that training design is based on educational research results. Constructivist, sociocultural and socio-cognitive approaches to development have led university Pedagogical Support Services to focus on: taking into account the preconceptions of science students (Smith, diSessa, & Roschelle, 1993); teaching situations that allow these preconceptions to be overcome (McDermott, 1991); and interactive educational situations among students (Hake, 1998). The think–pair–share (TPS) technique, which is commonly used in auditoriums in the United States (Bruff, 2009), has led to the use of electronic voting boxes. Educational research is at the heart of the training process, and introducing ICT also mobilizes educational research (didactics) in order to design learning activities. Both,

together, influence learning activities. This case is emblematic of any situation where research can improve quality. One interesting point is that the study accounts for how the introduction of ICT leads to educational research, in a context where higher education teachers receive little training in pedagogy. This raises a question as to whether educational research should be added to De Ketele's model as a full-fledged component.

The teachers' professional activity also appears to grow thanks to a new form of reflection on action, a reflection beyond the time of action. In reference to the tradition of the reflective practitioner (Argyris & Schön, 1974; Schön, 1983), this experience seems to sustain self-assessment for a more thoughtful, self-regulated activity. This is similar to the approach of "reflective practitioners" (Brookfield, 1995; Jorro & De Ketele, 2011; 2013).

A mechanism that supports the curricular approach and uses of ICT

The second case is the DevSup project (Loisy & Sanchez 2016). Here, the methodology is a form of design-based research, or DBR (The Design-Based Research Collective, 2003; Wang & Hannafin, 2005), an approach that combines pragmatic and heuristic goals. In terms of design, the projects aim to design and implement a digital environment to support the program-based approach. The DevSup project brings together researchers from the University of Montreal in designing an application called ALOES (online assistant for operationalizing teaching in higher education), which formalizes and disseminates training projects, and from the University of Sherbrooke for research on digital teaching systems and support to educational teams. As this theory is grounded in naturalistic contexts, a pedagogical team also participates in the DevSup project. The teachers on this pedagogical team work at the Ecole Normale Supérieure (ENS) in Lyon, France.

Six months after the project began, a first version of ALOES was implemented. It is an online editor that allows participants to share lesson plans, competency frameworks, teaching situations, and the modalities of student learning assessments. One year later, the effects of the DevSup project were measured using a qualitative methodology (Loisy & Sanchez, 2016). The authors state that the project leads to better program: all the participants rate the curriculum as good in quality. Respondents judged the quality based on the fact that it is more complete and more coherent and that it seems to better account for knowledge or skills acquisition by the students. Participation in the project also seems to affect teaching and learning practices (Loisy, Van de Poël, & Verpoorten, 2017). In particular, teachers use more collaborative learning activities with students by exploiting the possibilities of digital environments.

On the diachronic axis of De Ketele's model (2010), the program-based approach reinforces the relationship between curriculum, educational activities, and learning outcomes. The relationships are not only strengthened in the "downstream" direction proposed by the author, but also in the opposite direction. Indeed, constructive alignment (Biggs, 1996) emphasizes the development of learning activities conducive to achieving anticipated performances. Implementation of the DevSup project influences what De Ketele calls "the student's context." The source of student motivation is not identified by the members of the teaching team alone: students themselves help build their curriculum at meetings where they are asked to share their views on the program (Loisy & Sanchez, 2016). Their regular feedback is used to better adapt the curriculum to the relevant profession.

On the synchronic axis, external factors clearly appear to have an influence, according to the respondents (Loisy & Sanchez, 2016). The teaching team continually tries to better factor in the expectations of the professional community that will be hiring the students. To do so, professionals and students are invited to assist in developing the skills repository, which is adjusted regularly. As the training concerns an emerging profession, the educational

team also seeks to raise awareness about the training and to show the interest of the curriculum.

The design of the mechanism naturally relies on educational research, including work on the program-based approach (S. Johnson & C. D. Johnson, 2003; Prégent et al., 2009) and related matters. One study (Loisy et al., 2017) shows that this professional experiment influences pedagogy: teachers use technology to create the conditions of collaborative, active and contextualized learning for their students. In this case, contrary to the previous one, theoretical models developed by the research team for training design are not, in the strictest sense, taught to teachers: the teachers experience collaborative work. This experience gives them the chance to see how digital environments facilitate interaction, and this interaction helps them better understand their work as teachers, in other words, to develop further knowledge. This prompts the teachers to reproduce these collaborative situations with their students.

Teachers' professional development is another goal of the DevSup project. Thus, the authors (Loisy & Sanchez, 2016) also believe, in reference to the approach initiated by the Scholarship of Teaching and Learning, or SoTL, movement (Boyer, 1990; Hubball & Burt, 2006), that ICT must give teachers opportunities for professional development. SoTL promotes sustaining practices with theory and values the role that research can play in practice when the practitioner plays an active role in developing the reference frameworks (Bédard, 2014). Through this mechanism, development is supported by the fact that teachers must leave traces of their teaching in the ALOES application as well as in various tools and spaces and must share and exchange. Indeed, the results seem to show that respondents develop a curiosity about educational research and are thus aware of how important theory is to practice. Reflection on action grows. As such, research is also found in the "researcher on practices" teaching approach that the system is trying to develop.

Are there benefits to completing De Ketele's model?

The results of the case studies suggest that (1) the range of components identified by De Ketele is still relevant provided ICT is incorporated into the "*field of university pedagogy,*" or the field of teaching and learning in higher education. Two new aspects resulting from this analysis indicate that other aspects of the model should be reconsidered: (2) educational research appears to be an integral component; and (3) new relationships between components have been identified.

What place for ICT in De Ketele's model?

In the first case, the effects of ICT concern *Pedagogical activities* and *Results* on the diachronic axis of De Ketele's model (2010). ICT is mobilized by the university's Pedagogical Support Services in training session design and by teachers in their didactics and evaluation mechanisms.

In the second case, ICT influences the synchronic and diachronic axes of De Ketele's model (2010). Technologies are set up to contribute to the program-based approach; in particular, collaborative online environments are mobilized to help teachers to co-develop curricula, co-evaluate their coherence, and share didactic information. Combining the results of both cases studies, it is clear that ICT interacts with the educational dimensions *Curriculum*, *Pedagogical activities,* and *Results* on the diachronic axis. On the synchronic axis, ICT is influenced by *External factors* and *Contexts*. Their effects must be considered in order to better understand the "*field of university pedagogy*." De Ketele's model (2010) must therefore be completed by introducing ICT as a component unto itself.

Educational research as another full-fledged component

Additionally, the case studies reveal that the actors trigger educational research when they integrate ICT. Although ICT and educational research are found concurrently in the field, they are present

to varying degrees. In the first case, *Pedagogical activities* and *Results* on the diachronic axis of De Ketele's model (2010) are jointly influenced by the effects of ICT and educational research. Both are mobilized by the university's Pedagogical Support Services in training session design and by teachers in their didactics and evaluation mechanisms. Educational research (developmental approaches) and artefacts (clickers) are applied concomitantly for more personalized instruction and deeper conceptual learning. In the second case, the entire "*field of university pedagogy*" seems to be affected by ICT and educational research. Afterward, and because teachers see how interactions affect knowledge development, they go on to use ICT (the collaborative online environments used earlier in the program-based approach) to create more active and collaborative learning conditions for their students. In France, universities are pedagogically autonomous when it comes to defining curricula, which means that pairing ICT and educational research also seems to impact the curricula themselves. In a context where a curriculum is imposed, this phenomenon is not observed. As such, it was particularly interesting to carry out this study in the French context where there is a certain didactic freedom.

The changes introduced by ICT highlight the need for higher education teachers to understand and engage in a training process to help them better understand the phenomena at work: both cases analyzed here involve a vision of the relationship and interdependence between teaching and learning shown by scientific advances in our understanding of the learning process since the early 20th century (Poteaux, 2013). In the first case, the teacher also engages in research on teaching. Although educational research used to be far removed from higher education teaching, it is now part and parcel of the occupation. It seems plausible that educational research should be incorporated into De Ketele' model as a new component. After all, it is essential to interpreting and improving educational activities.

Interrelations that need strengthening

Another element seems obvious: a strengthening of the connection between components. As represented in De Ketele's model, *External factors* and *Contexts* affect the diachronic axis. And each of the three elements on the axis (*Curriculum*, *Pedagogical activities*, *Results*) affect the next, in that order. Our results confirm theses effects, but also indicate that their interrelations exceed the one-way effects.

In both cases, *Results* influence the design of *Pedagogical activities*. In the first case, unsatisfactory previous learning outcomes lead to a re-examination, and the following *Results* serve to control the effects of new *Pedagogical activities*. Consequently, *Results* can be seen as driving new *Pedagogical activities*. In the second case, the authors also point out that *Results* lead to a revision of the curriculum because they provide evidence of *Curriculum*'s capacity to meet the requirements of the students' job market integration or pursuit of further education. Although rather new in the French context, it is congruent with the program-based approach in which curricula are built to focus on training projects that define the person targeted at the end of the program and the skills to be acquired. Teaching and learning activities and assessment systems are developed on the basis of the training project thus defined. In the model, a double arrow must be introduced between *Results* and *Pedagogical activities*, and an arrow must also be added between *Results* and *Curriculum* (see Figure 1).

As expected in De Ketele's model, even though *Contexts* produces effects on the diachronic axis, retroactive effects are also expected. In the first case analyzed, the innovative educational process is weakened by the constraints of the university context, and actors demand reduced contradictions. The university context must evolve so that the innovative process can be maintained. A dual movement of influence should then occur between *Contexts* and the diachronic axis. In the second case analyzed, thanks to information sessions orga-

nized around the curriculum and the involvement of professionals in defining the curriculum, the teaching team can be seen, to some extent, as trying to influence companies to hire students after their education. A dual movement of influence should thus occur between *External Factors* and the diachronic axis: double arrows must be inserted on the synchronic axis.

De Ketele's model, revised

Following De Ketele's model (2010) and based on the results of case studies, Figure 1 includes ICT and educational research as full-fledged components interacting everywhere and as driving forces. The "*field of university pedagogy*" is organized in synchronic and diachronic axes. This representation better reflects the interactions between components: the influence of *External factors* and *Contexts* is not only downstream, like the forces acting on the flow of the educational process. The link between *Curriculum* and *Results* is no longer one-way. The "*field of university pedagogy*" should be considered holistically, where each component interacts dynamically with others, as indicated by the double arrows and the dual movement of influence between *Results* and *Curriculum*, added separately for a better understanding. This systemic view of interacting components shows the complexity and richness of the field.

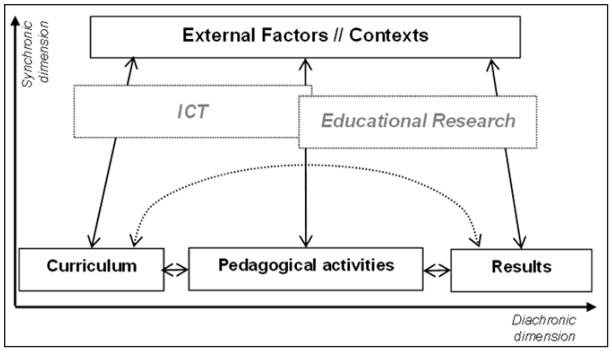

Figure 1 : A revised model of university pedagogy from De Ketele (2010): a multidirectional system integrating ICT and educational research (based on Lameul & Loisy, 2014)

Conclusions and perspectives

In his model of the "*field of university pedagogy*" based on international literature—to the best of our knowledge, the only model that exists to date—De Ketele (2010) does not specifically introduce the ICT aspect. Two case studies were conducted in order to answer the two following questions: "Where should ICT be located in the model?" and "Does introducing ICT lead to other changes in the model?"

The case studies attest to the relevance of De Ketele's model of the "*field of university pedagogy*," in which ICT can be added as a component unto itself. They show that this model must be completed by introducing not only ICT, but educational research as well—itself a full-fledged component closely tied to the introduction of ICT. Educational research is at the heart of the field and is the basis of teachers' professional development. It appears in two different ways: first, research strengthens practice through theory; second, when research overlaps with practice, actors tend to get involved in research actions.

In De Ketele's model, the components form a system, as the author points out. However, the case studies also strengthen its systemic aspect. Holistically, each component interacts dynamically with the others, separately and globally, as the entire system is in balance. From a systemic perspective,

the many factors that make up university pedagogy in the digital era are characterized in two complementary ways. First, they appear to be specific (i.e., they cannot be merged) and heterogenic (i.e., they are different in nature). Second, they should be viewed as consubstantially associated. The field can therefore be considered a system with multiple interactions, each subjected to a double characterization: that of each component at play and that of the interactions between these components. This supports a strengthening of the systemic dynamics of teaching and learning in higher education. The case studies seem to illustrate an organic relationship between educational research and the introduction of ICT in teaching and learning. This relationship may offer opportunities to assess learning quality in higher education (Albero, 2014).

Once introduced, ICT seems to alter the system in which pedagogical activities take place. ICT serves as an analyzer in the sociological sense of the term (Lapassade & Lourau, 1971), that is, it emphasizes and renews questions on teaching and learning (Gueudet, Lameul, Trouche, 2011). The questions it generates regarding practices appear to be a source of pedagogical development (Loisy, sous presse). The use of digital teaching and learning systems accelerates and amplifies reflections on education because it systematically confronts education actors with fundamental questions on teaching and learning—a Trojan horse, as it were (*Odyssey*, Homer, eighth century B.C.E.). ICT appears to be secondarily introducing the educational issue, like the wooden horse in the Athenians' plot to defeat the city of Troy. ICT cannot be considered a trivial matter that embellishes higher education. The advent of ICT brings about change because it increases awareness and generates a disturbance that leads to a quest—on the educational research side—for the keys to a better understanding of teaching and learning.

Indeed, ICT seems to be everywhere, with each component of the model more or less directly impacted by ICT development: in political, social, cultural and economic expectations; in students' expectations in terms of organizational innovation; in the search for meaning in knowledge; and in certain educational activities that promote learning. This leads to another question: "Can there be 'digital pedagogy in higher education'?" This would allow ICT to be included in a general educational questioning, while bearing in mind its specificity and interrelations with learning processes. "*Digital pedagogy in higher education" has temporarily been defined as "a field of research and intervention that, in higher education, aims to render understandable training situations using the potential of digital technologies, considering the various dimensions that partially characterize it (including the political, cultural, engineering and technical dimensions)*." (Lameul & Loisy, 2014, p. 200).

Another discussion concerns the necessity of associating the words "digital" and "pedagogy." Since it is argued that ICT is part of every component interacting in the field, the need for further specification can be reasonably questioned. This choice is above all contextual. Today, as has been pointed out, the educational applications of ICT are still growing and its use continues to spread; however, in the near future, this association, which both binds ands separates, may no longer be useful. This paper should be viewed as an attempt to draw attention to the need for more extensive research in order to consolidate the effects identified. This exploratory work has enhanced De Ketele's model. The next step is to use this augmented model to study other cases and other mechanisms in different contexts. By combining these studies, this augmented model of the "*field of university pedagogy"* could be definitively validated by factoring in changes in the digital era. The model would then become both a framework for new research and a basis for work intended for the pedagogical support service units at universities, provided it is completed by more operational and pragmatic tools and designs.

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