



# “Pedagogical Innovation Centres”: Precursor for Research in Educational Sciences Promotion in Moroccan Higher Education

S. Machwate<sup>1</sup>(✉), L. Echajari<sup>2</sup>, R. Bendaoud<sup>1</sup>, K. Berrada<sup>3</sup>, and L. Daadaoui<sup>3</sup>

<sup>1</sup> TransERIE, Université Cadi Ayyad, Marrakech, Morocco  
s.machwate@uca.ac.ma

<sup>2</sup> Université de Technologie de Troyes, Troyes, France

<sup>3</sup> Université Mohammed V, Rabat, Morocco

**Abstract.** Public higher education reflects the image of a country’s development. The quality of courses and training directly influences access to an increasingly global labour market and the promotion of locally profitable scientific research. In an administrative and technical framework, the Pedagogical Innovation Centres (CIP) of Moroccan universities aim to develop innovative teaching practices to reduce the issues influencing teaching and learning situations. The objective is to provide graduates with more academic and global skills. It is an extant condition for accessing the labour market or for pursuing a research project. Pedagogical innovation tries to transcend this path by collaborating with researchers to develop more effective and efficient teaching practices. In this article, we will explore the field of the development of teaching practices through the implementation of CIP. We describe their objectives, their components, and the benefits they derive from research for the improvement of educational sciences in the Moroccan university, through a close collaborative relationship with researchers.

**Keywords:** Pedagogical innovation centres · Research in educational sciences · Collaborative research · Moroccan Higher Education

## 1 Introduction

In Moroccan universities, the introduction of Information and Communication Technologies for Education (ICTE) began at the earliest of the 2000s. The aim of this action was to develop teaching practices and thus, higher education.

Universities’ staff have embarked on the use of ICTE as a means of modernizing their teaching practices. The pioneers were tech and computer gurus. They were a minority among teachers and generally, this spirit of innovation in their courses drives tech-savvy teachers. The other majority of teachers showed reluctance towards the systematic integration of ICT in their teaching [1]. The initiatives announced by the technophile minority were marked by a kind of “innate” appropriation of these ICTEs as objects of their own learning and not tools in the service of teaching-learning [2]. On another side, the lack of a homogeneous vision at the institutional level was noted, even agreed

by the universities or national specifications, to propose a digitalization of the training structures and content for usage by all the learners [3].

The educational reform in Morocco, the Moroccan Virtual Campus, and the 2009–2012 Emergency Program, all called for the use of ICTE to modernize and democratize access to knowledge. Investments in the upgrading of ICT infrastructure have not been able to achieve wide and rapid adoption of ICT in training programs.

Meanwhile innovations in technological practices were often imposed by international trends without adapting these innovations to the Moroccan context. To our knowledge, no study has been directed towards the meaning of globalizing or generalizing a process of learning through ICT in Moroccan higher education.

Following initiatives launched by Cadi Ayyad University (UCA), through the establishment of its Pedagogical Innovation Centre, initially called Pedagogical Innovation Cell, and which has been adopted by other Moroccan Universities later, the supervisory Ministry has integrated these Centres into the institutional organization chart of universities with the aim of modernizing teaching practices in the University.

In this article, we try to expose the stages of teaching practices modernization at the university by innovating with ICTE. We give a description of actions of some similar structures of CIP in other countries. And we continue by describing the experience of the CIP of the UCA and its role in the promotion of research in educational sciences, and its impact on teaching activity at UCA.

## 2 Pedagogical Innovation at the University

By sensing a brief prospect in the field of jobs of the future, disrupted by technological innovations, we note that several international organizations have requested innovative educational approaches to inculcate new prerequisites and global skills for future workers [4, 5]. In the actual context (globalization, Industry 4.0, digitalization...) trades and services will require a more technologically qualified workforce. Indeed, it requires from workers more technical competences and collaboration capabilities in global interconnected systems [6]. This can only be possible through innovative education systems. Indeed, innovation, as it is defined, is an act of change that modifies the structure and results of a process or method to obtain a better product or service [7–9].

In pedagogy, innovation is a central element that aims to change the act of teaching by responding to the contexts and the nature of the learners' needs. And, the cognitive and social nature of the learning is the element that determines the teaching practices and methods to be put in place [10]. Rousseau, for example, proposed an innovative method of education, in his time, based on an active pedagogy where the learner contributes to the construction of his knowledge while the teacher guides him. This innovation cuts with previous methods based on a transmissive form of bookish instruction aiming to shape a model citizen (priest, scholar, bishop...) in particular [11]. This transformation initiated the transition from a school placed in a framework limiting training courses to an open school adopting methods more centred on the learner allowing him greater freedom of choice of course. Something that was and still is relevant today. At this level, innovation is at the level of teaching practices [12].

Advances in the field of cognition and learning sciences have also undergone developments. Psychological theories of learning have shown that learners construct their

knowledge in different ways. For Skinner and Watson, human beings learn behaviourally through the reception/transmission of information. Piaget, in his constructivist theory, states that human beings learn by adapting to the environment in which they live. They assimilate external information and adapt it to achieve a balance that increases their knowledge. The socio-constructivism promoted by Vygotsky defines learning as linked to a proximal zone of development where the learner interacts with others to expand his knowledge [13].

Innovations in cognitive science have thus contributed to the development of innovative pedagogies. The pedagogy by project initiated by John Dewey (1920), for example, deals with the aspect of learning by doing which involves the learner in the construction of his knowledge through a direct experience of his own know-how [14]. Differentiated pedagogy, on the other hand, allows the teacher to adapt the content and method of his teaching to the learners. These are considered to have different skills and learning profiles. It allows adaptive teaching and cuts with the practice of “One size fits all” where learners are considered equal in their ways of learning [15]. Active pedagogy, as another example, can be defined as all “educational activities involving students in action and reflection on what they are doing” [16].

All innovation stems from a methodical thought process with a view to obtaining a result for the benefit of man and society [17]. Drucker refers, already at the beginning of the 1960s, to the fact that innovation is the essence of research work in universities. He notes that innovation benefits actors outside the university more than it benefits itself. He also notes that the use of technology is not synonymous with innovation in teaching if it is not linked to innovative teaching practices.

Peraya, meanwhile, merges this dimension of innovation in teaching and that of the introduction of technology by qualifying it as techno-pedagogical innovation [18]. He underlines that any techno-pedagogical system of any training must be built on a model that takes note of the characteristics of the different actors (learners, teachers, and administration) to successfully integrate ICT in teaching. Pedagogical innovation cannot then be adopted randomly but must refer to a clear and objective methodology. Conversely, transgenic innovation, which is defined as a disruptive approach in education that encourages the modification of the moving parts of the educational chain, cannot be considered an educational innovation [19]. Any pedagogical innovation process must be subject to strict rules guaranteeing the response to the expectations of all actors in the education sector, not only the rules for the design and implementation of training but also the outcome of the contract (syllabus), the objectives, and purposes initially announced [20].

The introduction of ICTE has been able to combine advances in cognitive science with different pedagogical approaches and has given rise to new techno-pedagogical models. Distance learning platforms have offered several tools that make it possible to apply the type of pedagogy desired by the teacher. The latter, having the choice between behaviourist, constructivist, or other pedagogies, the teacher plays much more a role of mediator or facilitator [21]. These platforms facilitate the forms of mediatization of educational content and the mediation of interactions between teachers and learners in classroom or in distance learning systems [22].

The educational and economic contributions of the use of digital technology in online training guide decision-makers in the education sector to adopt innovative models in their institutions. Undoubtedly, innovation in its techno-pedagogical form has played and still plays a decisive role in improving the performance indicators of universities. The theoretical basis of innovation in the context of education implies the need to define clear objectives of the training systems proposed that stimulate the creative and innovative potentials of teachers and learners. The rise of new media and technologies, the immersion of learners in this media-rich environment, and the growing desire of learners and organizations for the acquisition and construction of knowledge encourage thinking and developing creative approaches and installing innovative pedagogies. These may advance better learning outcomes and improve learning skills and competencies for all [23]. Pedagogical innovation is thus part of a cyclic dynamic since a successful innovation today always remains within the possibility of being improved or developed tomorrow [24].

It is therefore important to think about the future of these innovations to essentially meet the needs of learners. It is necessary to assist teachers in terms of administrative and technological infrastructure and related training to succeed in this mission. The effectiveness of these innovations in higher education cannot arise without the adoption of new forms of organization, both in administration and in teaching [25]. The related national policies and strategies can promote the processes of their implementation and achieve the expected results [26]. These policies cannot be put in place without having dealt with and validated examples of initiatives that have proven their success. Generally, the research results obtained during the study of innovative projects encourage decision-makers to generalize their practices at the local or regional level [27, 28].

This is also the subject of a research analysis conducted by Bécahard and Pelletier. They conclude that innovation is a five stages process: from analysis of context to idea, from idea to occasion, from occasion to project, from project to class and from class to institution. Nevertheless, they invite stakeholders to think about, and to implement the innovative educational model the university has to undertake. This model must consider local organizational and personal issues in its operationalization and institutionalization. These issues relate to the legitimacy, credibility, feasibility, effectiveness, and quality [29].

It is exactly this scheme, without having studied it or followed it in advance, which led to the establishment of CIPs in the organization chart of Moroccan universities institutionally and organizationally. We believe that the initiative led by the UCA through the creation of the first version of the CIP entitled “Cellule d’Innovation Pédagogique” and the results it has been able to demonstrate following the research work of the TransERIE team installed on its premises inspired this institutionalization.

In this paper, we will describe these steps and the contributions from the point of view of improving teaching practices at the university, but also from the point of view of the propulsion of research in the sciences of education.

### **3 Pedagogical Innovation Centres**

Universities, concerned about the quality of the training of their graduates, have put structures that innovate teaching practices in their organization charts. Each has chosen

the denomination that suits its objectives, but all refer to educational innovation structures. We cite some examples in Table 1. For the development of their activities, these centres rely on individual or group initiatives working to develop learning for the benefit of students and by launching calls for projects within the framework of their activities.

**Table 1.** Global structures of CIP

Structure	Objectives	Components	Link
Center for Pedagogical Support at the University of the Côte d’Azur (CAP-UCA)	Support for teachers through training, support and provision of resources around pedagogy and tools	Computer engineers, Pedagogical engineers, Audiovisual producers, Assistants	<a href="https://univ-cotedazur.fr/formation/soutenir-la-transition-pedagogique/accompagner-le-personnel-enseignant%C2%A0">https://univ-cotedazur.fr/formation/soutenir-la-transition-pedagogique/accompagner-le-personnel-enseignant%C2%A0</a>
Center for Pedagogical Innovation and Evaluation of the University of Aix Marseille (CIPE-UAM)	Support, develop and enhance the teaching skills of teachers, researchers and lecturers	Directors, Pedagogical Engineers, Audiovisual Engineers, Assistants	<a href="https://www.univ-amu.fr/fr/public/le-centre-dinnovation-pedagogique-et-evaluation-cipe">https://www.univ-amu.fr/fr/public/le-centre-dinnovation-pedagogique-et-evaluation-cipe</a>
Center for Support and Innovation in University Pedagogy of the University of Quebec in Outaouais (CSIPSU-UQO)	Support the continuous improvement of teaching and supervision in order to promote student’s success, while contributing to the development of quality distance learning	Director, Pedagogical Advisors, Educational Technology Advisors.	<a href="https://uqo.ca/csipu">https://uqo.ca/csipu</a>
Pedagogical Innovation Laboratory of the University of Geneva (LIP-Unige)	Design-oriented research on the uses of digital technology in education	Researchers, practitioners, computer scientists, designers	<a href="https://www.lip-uni.ge.ch/">https://www.lip-uni.ge.ch/</a>
Pedagogical Innovation Centre of Ibn Zohr University of Agadir, Morocco (CIP –UIZ)	Support for educational development and innovation. Enrich and diversify the pedagogical practices of teachers in order to promote student success.	Teacher Researchers	<a href="http://cip.uiz.ac.ma/">http://cip.uiz.ac.ma/</a>

We will use the term CIP for these organizational typologies in the rest of this document.

The choice of these CIPs (Table 1) is due to the similarities between the higher education systems in the francophone countries. By browsing the websites of the CIPs mentioned above, we notice that they offer several services to university teachers to improve their teaching practices. We have tried to summarize the most shared aspects among these different CIPs.

### **3.1 Techno-Pedagogical Monitoring and Proposals for Innovative Solutions**

It is a question of ensuring a watch on the latest innovations in the field of technologies applied or applicable to teaching with a vision of improving teaching and learning. The best ones are then proposed to teachers to test or apply in their courses.

### **3.2 Training (Tools, Technologies, Pedagogies, Evaluation)**

Ensuring innovative and practical training appears as the cornerstone in all CIPs. Indeed, teachers, ancient or fresh ones, seek to feel autonomous and effective in their teaching practices. They ask CIPs for training on innovative pedagogies, technological or techno-pedagogical tools for managing or creating innovative learning experiences, and producing attractive teaching material and implement more reliable assessment practices.

### **3.3 Support (Accompaniment, Advice, Implementation of New Training Systems)**

Other teachers ask for support during the implementation of their innovative practices, whether on the pedagogical, technical or media material level.

### **3.4 Digital Production**

Most of the CIPs have structures for the production of digital content, and in the audiovisual format in particular. Putting scripted courses online requires the transition from didactic materials to more elaborated digital formats suitable for online learning.

### **3.5 Guides and Tutorials**

With the aim of reaching a large number of teachers, the CIPs offer tutorials or guides for content production, educational scripting, and manipulation of platforms, or technological tools.

### **3.6 Communication and Sharing Action**

The CIPs also organize events, meetings, and debates for the benefit of the community of teachers intrigued by educational innovations. The objective is to speak the same language and share examples of good teaching practices.

### 3.7 Qualified Staff

The CIPs are also staffed, each according to the size of its university and the degree of involvement of its leaders, with qualified workforces. These are teacher practitioners or researchers in the field of pedagogical innovations, engineers in educational technologies, technicians, and other consultants or experts.

## 4 Case Study: CIP of UCA

### 4.1 Structure

The CIP of the UCA is made up of a team of three permanent people. Two teachers who, in addition to their initial function at the university (i.e. research and teaching), provide administrative management, set up projects, and monitor the actions of the CIP. An administrator who adapted, over time, the various technical and pedagogical tasks to provide technical and pedagogical support in collaboration with the other two teachers during the implementation and execution of the centre’s actions. This team is supported occasionally by other technicians who carry out temporary tasks [30].

The centre enriches its activities by participating in national and international collaborations around research and development of projects. These actions were facilitated by the fact that the centre houses a research team specialized in the field of educational innovations [31].

This allowed it to launch several initiatives that were adopted not only by the components of the UCA but also by other Moroccan universities. In the following, we present some of these flagship innovations.

### 4.2 Research Methodology

We conducted a longitudinal case study within the CIP. The first author of this article is the principal involved in the development of the CIP and thus in the process of data collection. This study allowed us to collect varied data that were very suited to carry out the objectives of our research. First, we collected qualitative data through observations and semi-structured interviews (with users, teachers and decision-makers). Second, we collect quantitative data through statistics conducted with users (especially students). All of these data are part of a large study conducted on the subject of the CIP, university pedagogy...In this paper we use a part of these data to describe how the CIP contributes to the promotion of research in the sciences of education in Moroccan universities.

### 4.3 Actions of the CIP of UCA

- *Video based learning (VBL): UCAMOOC*

It is a video teaching/learning system. Its concept is based on the production of pedagogically designed video capsules at a relatively low cost for the benefit of university students, initially, and for all as they are open education resources (OER) [32]. This concept of OER prompted the CIP team to integrate an Erasmus Plus project (OpenMed Project), which provided the CIP with more expertise on that field [33].

- *Practical work simulation: EXPERES*

The EXPERES project is set up following a project of the Erasmus Plus program, which aims to strengthen teaching capacities in Moroccan universities. This project has made it possible to set up platforms for virtual practical work for the benefit of students in the first years of the faculties of sciences in Moroccan universities. Massification in universities has imposed the interruption of the exemption from this practical work under normal conditions. This solution made it possible, initially, to make available to universities a dozen manipulations of practical work in physics, then its generalization and adoption by the supervisory Ministry to put practical work from other disciplines into it later. It is a relevant innovation insofar as it allows students to develop reflective capacities and improve their learning [34].

- *Computer-assisted experimentation: ExAO*

Computer-assisted experimentation (ExAO) is another field of development of pedagogical innovations in practical work. It aims to introduce innovative practices in laboratory experimentation to reach better educational outcomes. At CIP, collaboration with the departments of physics, chemistry, and biology to modernize measurement practices using interfaces connected to the computer allows more reliable data collection and better-established analyses [35]. In addition to the educational contribution, this innovation brings a very significant saving of time of manipulations [36].

- *Open educational resources:*

The CIP houses the Open Education Centre on its premises. It is the result of collaboration within the framework of an OpenMed project of the Erasmus Plus program. This centre aims to promote the creation and use of Free Educational Resources and Practices in the university. At the UCA level, the CIP has launched several training courses in this direction and has contributed to the dissemination of these practices and their generalization among other Moroccan universities. This was crowned by the adoption of the Ministry of these practices in its national strategy [33].

- *Hybridization of training: MOOC and SPOC*

The CIP assists project leaders in the development of their teaching practices. The production of audio-visual content and the scripting of courses in an online teaching configuration has allowed the development of MOOC practices to circumvent the constraints of massification, and SPOC for more targeted learning in the university. This led to the implementation of hybrid training systems, which became an area of expertise for the CIP of the UCA. Whether for the hybridization of initial or continuing training [31, 37]. This know-how, calling on a highly developed mastery of the components of online and face-to-face teaching, has made it possible to implement training systems adapted to the needs of the UCA. On the other hand, this expertise led to set pedagogical and organizational solutions to ensure pedagogical continuity during the COVID-19 crisis [38–40].



- *Improved pedagogies*

The actions of the CIP concerned the implementation of several training systems aimed at improving teaching pedagogies. Active pedagogy, flipped classroom, or hybrid teaching have been tested in several cases and the results have been communicated to teachers so that they can integrate these practices into their teaching. These pedagogical practices aim in addition to improve learning, adapt to the individual needs of learners, and develop their transversal skills [31, 37, 41–43]. The research established around these pedagogical innovations, among others, has prompted decision-makers to think about setting up structures dedicated to dealing with the problem of mastering the language of learning and research and the development of transversal skills.

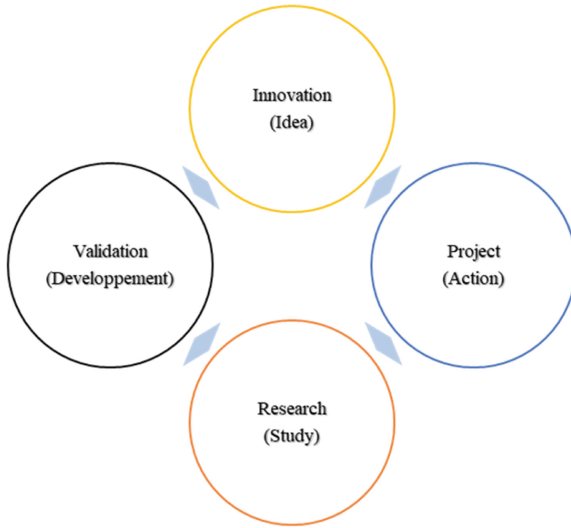
## 5 Discussion

The success of pedagogical innovation actions in the university requires the commitment of a team of highly qualified professionals, the institution’s commitment, and significant financial resources [20, 26]. The support of such structures in charge of pedagogical innovations and the promotion of scientific research in the educational domain, will ensure significant results for higher education institutions but also to the benefit of teachers and learners [44].

The actions carried out by the CIP of the UCA are much diversified. They require continuous commitment of a multidisciplinary team and considerable financial support from the institution. The case is that this team is made up of three people: two teachers and an administrator, and the budget allocated to the CIP does not exceed 250,000 Moroccan Dirhams per year (\$25,000). However, the actions undertaken suggest that other actors have contributed to their realization and their implementation. Indeed, a set of other factors contributed to this success. It stems particularly from merging research with the CIP actions.

Research and Innovation team TranERIE, set by these two professors involved in the management of the CIP, and the domiciliation of this team in the premises of the centre made it possible to create a fruitful dynamic around innovative educational practices. It has shown that it was for the benefit of the two structures (the one of research and the administrative one). On the one hand, the pooling of resources (human and material) has enabled the development of the centre’s actions and the promotion of the team’s research work. On the other hand, this collaboration has made it possible to participate in national and international projects bringing other financial resources, other innovative actions, and expertise. The development of CIP activities is part of a continuous cycle of innovation as mentioned in Fig. 1.

Each of the actions undertaken by the CIPs is born from an idea that aims to solve a problem that disrupts the act of teaching/learning and reduces the success rates of learners. We give as an example the problem of massification that imposed the suppression of practical work in the first year of the faculties of sciences, or another example related to the problem of the non-mastery of the language of learning of science (French) which frustrates a large proportion of learners. These ideas are put into action through the development of innovative projects at the CIP level. These projects are tested and evaluated before they are generalized in the university. We cite the example of the Experes



**Fig. 1.** Cycle of the pedagogical innovation at the CIP of UCA

practical work simulators or the VBL UC@MOOC. The TransERIE team is in charge of the research component of these projects from the idea, their implementation, their test phase, and their generalization. The established research studies have made it possible to measure the impact of the proposed solutions on learning and the development of the internal performance ratio of the university. More generally, these studies have contributed to improve the innovations brought by the CIP and, in a way, to validate them for the community of users through research results. And the cycle begins again.

In another aspect, the collaboration between the CIP and TransERIE has facilitated the integration of their mutual activities into large-scale projects. At the national level, the communication days carried out by the two structures have made it possible to establish partnerships for the development of innovative projects in pedagogy and research. For example, we quote the MOOCs launched within the framework of the call for proposals by the Ministry within the framework of the national MOOC platform (MUN). At the international level, this expertise of the two structures has been consolidated by participation in projects such as Erasmus Plus. These projects are dedicated to the development of the capacities of universities on several levels and of course by their considerable financial contribution.

The benefits of these partnerships have concerned the research component by allocating more subsidies for the acquisition of the necessary equipment but also by offering mobility possibilities for researchers favouring the forging of peer-collaborations allowing the publication of their work in highly indexed journals. In this article, we cite 14 of these publications related to our subject, but, being members of this structure, we advance that there will be 30 publications between 2018 and 2021 with the help of the CIP of UCA.

We can confirm, after having presented all these elements, that research in the sciences of education has greatly benefited from the CIP structure which has enabled it

to benefit from a vast field to carry out studies, the technical and organizational means, and in some cases financial means through the facilitation granted for access to collaborative and research projects.

## 6 Conclusion

Research in education is located between two sides. First, the obligation to meet the expectations of institutions that have become aware of the crucial role it plays for the development of societies. Second, satisfying the requirements of this research at the meeting point of several disciplines (Psychology, economics, history, sociology, management, etc.) [45]. Research in the sciences of education is considered as a field of endless battles. Continuous changes in training curricula, technological development, the perpetual need to learn quickly and efficiently, and the emergence of increasingly innovative practices that disrupt the act of teaching and learning are “upsetting” this knowledge transfer/acquisition relationship [46]. Higher education institutions are aware of these changes. They have worked to put in place support structures at the administrative and technical level.

In this research, we tried to demonstrate that the role of CIP structures can be more beneficial to institutions if they collaborate with sciences of education research entities by illustrating the collaboration between the CIP of UCA and TransERIE group of research. At the same time, researchers in educational sciences will benefit from more resources and means offered by these CIPs to set better and practical research actions adapted to their local situations.

We believe that the generalization of this approach in Moroccan universities could provide educational solutions more suited to their contexts through research studies more focused on their practices and their needs.

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