UC@MOOC: Pedagogical innovation to challenges of massification at university level in Africa

K. Berrada, **R. Bendaoud, S. Machwate, A. Idrissi, A. Miraoui**
Cadi Ayyad University, Abdelkerim Khattabi Avenue BP.: 511- Marrakech - Morocco

E-mail: berrada@uca.ma

(Received March 3, 2017, accepted March 16, 2017)

Abstract

This work presents the UC@MOOC project as a pedagogical innovation to face effect of massification that are creating constraints endured at Cadi Ayyad University as well as for other African universities during these five last years. It aims among its objectives to cope with the massification and to overcome the language difficulties of students. Through this project, we are aiming firstly the reduction of academic failure and other, come to the new training needs. Courses are scripted and posted online do not require as many resources and their production cost is relatively low. The same realization is possible for the South, where we find the same problems facing the growing number of students. Audiovisual digital contents also enable us to save time, going to an hybrid teaching or even flipped classroom in some cases. The idea is not to suppress the face-to-face courses but, instead, to place teachers at the center of this educational innovation. The online posting of free contents allows students to deepen knowledge autonomously and independently. We will present the low cost economical model that has been used to support this initiative and the challenges we are facing. Some provided ideas on the critical success factors of this initiative will be described and discussed.

Keywords: MOOC, e-Learning, OER, blended learning, flipped classroom, academic failure, open courseware platform.

PACS: 01.50.-i, 01.50.F-, 01.50.H- **ISSN 1870-9095**

I. INTRODUCTION

Distance education and e-Learning has been subject of many research these last years. It seems that its adoption in higher education is faced today challenges in most developing countries resulting from global economy changes and rapid expansion of knowledge. In the say way, Cadi Ayyad University has adopted the UC@MOOC [1] initiative as a platform offering audiovisual contents of courses open online for students. These digital contents consist of modules that are given in classes for various levels. Courses are scripted and recorded according to the same curricula that are offered at the university. This initiative is inspired from the Massive Open Online Courses (MOOC) that has been approved for its economical model in the developed countries.

Subject to some controversies from academicians the project was designed as a low-cost model of pedagogical innovation that cost to the Cadi Ayyad University a minimum of human resources.

This paper will present both dimensions of this innovative strategy, technological and pedagogical. Then we will described and discuss a case study to analyze its users. However, it would be very important to discuss the circumstances, context and causes that led to this initiative, and to list the different constraints and needs to that UC@MOOC is answering.

During the last decade, Morocco in his politics of an accessible and generalized education arrive now to a considerable advance regarding schooling. It is true that this democratization of accessing education reached primary, secondary and tertiary levels. The brut rate of schooling [2] in tertiary level has shown a growth from 11.7% in 2005 to 24.6% in 2014. It has indeed more than doubled in 10 years, and the ministry of higher education is predicting that this figure will come to reach 28% in 2016. However, this rapid increase in the number of students, or massification as it is called, is well measured and qualified by political authorities that is in principal a key factor for human and economic development, and it has not been well taken care of, particularly regarding the substantial requirements of human resources training and infrastructures. Then, significant and fast constraints emerged essentially regarding the capacity of the university to support students, especially in open access institutions. In 2015, Cadi Ayyad University registered an average of one teacher for 48 students and the situation is becoming more critical [3].

At Cadi Ayyad University (UCA), the number of students has been increased during the period 2009- 2015. This rapid evolution has been multiplied by a factor of 2.4 every year. The total number of students has reached 69000 in 2015. This huge increase of students is presented in the following graph (figure 1). According to many projective

studies taken by Higher education ministry, the student's number is subject of an increased variation in the next few years and till 2018.

From this graph, it comes out that in 2015 UCA is providing only 100 places for every 148 students. Generally, this capacity conducts to a veritable condensed public in Amphitheaters and classes. Many factors as well as noise, insufficient chairs, linguistic difficulties – especially encountered by new graduates, disrupts the regular courses progress. Teaching in Arabic scientific subjects in primary and secondary school is not guiding to a good practice of French language after completing secondary level. At university, French is the main language used to teach science and technology, so the graduates have to adapt to this linguistic deviation. It is observable that a big part of students are not able to adapt well their learning during a two years training at the end of secondary school.
In addition to these facts, an additional socio-economic reality is facing students of UCA considering the fact that a significant proportion of students are coming from modest or disadvantaged areas surrounding the region.

When all of these constraints are brought together, it's ought to say that these difficulties encountered by students give a clear and understandable reason of academic failure because 25% of students drop out during the first year.
Generally, Moroccan educational system was estimated to be a little inefficient according to many studies. We are mentioning in particular the UNESCO report [2] in 2010 that has disseminated the results of a study that took place in Morocco at large scale of students. This report highlighted the weak educational acquisitions from primary and secondary school. A serious accumulated gaps from these levels that may disturb learner's success in tertiary level.

I. HISTORY AND GOALS OF UC@MOOC

UC@MOOC initiative is a platform, which provides online access to learning materials for students at Cadi Ayyad University (UCA) in Morocco. It was established in order to resolve the problem of over-large classes, and contains a variety of course materials in the form of podcasts, videos and other resources. The case study outlines the background to the initiative, and provides some statistical details of the courses hosted on the platform. There is also some discussion of the importance of using a variety of pedagogies in order to support the high numbers of students.

At the beginning of this innovative project, the main target was to resolve the problem of over- large classes at this university. After three years working, the platform includes more than 240 sequences of videos and covers a number of educational fields in French, Arabic, and English.

UC@MOOC is an educational platform designed to provide Moroccan students with open access to facilities. The educational content is adapted to the Moroccan context. It is run by the professors of the UCA, and the ability to save module fundamental channels of open access facilities to support students in their integration in HE. This process allows students to contact their teachers as many times as they want and thus create a real interaction that will allow students to deepen their knowledge independently. The UC@MOOC library now includes a multitude of courses in different disciplines in audiovisual form. With this educational innovation, UCA has already put on the Web courses, TD and TP in addition to a series of public lectures on societal themes for the dissemination of knowledge at large scale. The main objectives of the project UC@MOOC are:

- The reduction of university dropout (less than 25% in the first year).
- Mitigating the effects of massification.
- Improving the internal efficiency of the UCA.
- Support with language difficulties.

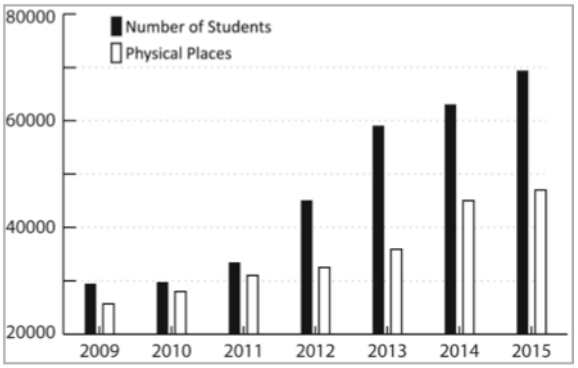

FIGURE 1. Evolution of student's number and potential capacity from 2009 to 2015.

The main contents of the UC@MOOC are podcasts, courses wares and videos that offer open and free access to the resources. According to interviews with some students, this way of displaying courses is useful and helps them to progress in their studies. Teachers as well are very happy to provide their contents online, which add a real value to their courses. In the meantime the initiative contributes to reduce the consequences of a mass amount of students in the classrooms and provides these courses to students anytime and anywhere.

II. KEY ASPECTS OF THE INICIATIVE

The strategy at UCA was designed according to the needs of the institution. This meant that individuals were motivated to engage in and complete the project. There were three main ways in which the UC@MOOC project was seen as a solution to challenges at UCA. These were:

-Massification of HE:
UCA has 75,000 students, increasing by 12% per year. There is one teacher to 48 students on average, and 160 students applying for 100 places at the institution.
-Language difficulties:
The provision of courses in English, Arabic and French is designed to help students increase their language capabilities.
-Methodological difficulties:
UC@MOOC was seen as a way to reduce student's failure and dropout rates.
-Strategies and policies:
UC@MOOC is also part of the digital pedagogy implementation strategy of the UCA. In recent years the digital world has invaded all aspects of our society. Its use is now becoming essential and opened many fields in education and training, influencing all teaching levels. For its new dimension related to knowledge, digital pedagogy take in account both teacher and learner. Similarly, its use opens up new communicative possibilities in in the teacher-student ratio and allows its extension.

Thanks to Internet's expansion, the structure of our education system is being challenged. The university, a leader, has to work in an ever- changing environment. It should ensure:

- More suitable and effective new teaching.
- Approaches.
- Better management of different needs in schools and universities.
- Self-directed and collaborative learning in class.
- Teaching students according to their needs and abilities.
- Digital tools for learning.

Organizational changes:
Implementing digital pedagogy is a preferred choice at UCA in a context of massification. The problem of large classes in Morocco creates not only difficulties in human resources management, but also problems of employment in the absence of adequacy of the education and training system to the needs of the local economy.

The strategic planning to manage both the growth in student numbers for 2020 and find new solutions in the modes of transmission at universities, are required and should be a national priority in education. Building more classes may not be the only solution in the medium and long term. The training should also provide innovative solutions to reconsider our vision of HE. However, digital education requires from students real work of organization and motivation. At the university, the contact with the teacher, and discussion with other students remains important in a university course. Administration of digital content in the form of course materials, tutorials and lab give students a better level of integration and support. This is a revolution that could change the modes of learning in HE.

III. UC@MOOC AT THE HEART OF PEDAGOGICAL INNOVATION

On the pedagogical aspect UC@MOOC can be considered between Open educative resources and MOOCs. But it can not be easy to define it as well, since the main targeted audience are the students enrolled in Cadi Ayyad University but not only. Offering this initiative to a large public it has been possible to carry out a hybrid teaching and flipped classrooms where face-to-face and distant learning is becoming complementary.

UC@ MOOC has facilitated the relationship between teacher and student. The latter, using recorded audio-video courses in advance via the Web, DVD.., has the opportunity to navigate through the content of course illustrated with graphs, sound and image. He/she can learn in different situation courses to better assimilate and understand during the face-to-face classes.

Furthermore, this method also allows the student to follow his lecture in better conditions than in the crowded lecture hall. Also, it allows the teacher to work under different conditions. During face-to- face classes, the teacher can devote more time to the explanation and questions from students who have already viewed the course via the web or on DVD. In terms of resources produced, they are available on:

- Platform with free access to all students.
- Audiovisual supports scripted.
- Face-to-face classes.

Their production is supported by:

- Studios equipment with basic equipment.
- Screenwriting support for lecturers.
- Fast, efficient and affordable post-editing.

We have learned from the implementation of this project another innovative pedagogies. The first one can be classified as a hybrid approach and the second one as a flipped classroom teaching. Such a model is shown in figure 2.

FIGURE 2. Pedagogical approaches that has been tested at UCA in 2016.

IV. UC@MOOC INITIATIVE'S SUITABILITY

(a) Infrastructure and Technologies:
UCA has launched, in partnership with Microsoft, an important project to cover Marrakech institutions with broadband Internet via the latest wireless technologies. The

project was achieved in June 2015. In addition to that, Maroc Telecom and the ANRT (National Agency of Telecommunications Regulation) as project partners helped us in the establishment of an infrastructure of Data center, optical fiber, wireless access points,.... Then networking all the institutions located in Marrakech. More than 180 Wi-Fi access points spread over 9 institutions can support up to 170,000 users have been established and are operational. The project also includes the establishment of radio access points called TV White Space (TVWS). Users also benefit from a suite of free services (Outlook, Office 365, onedrive, etc.) for better collaboration and productivity.

(b) Suitability:
After we have listed all of these elements that shows a big picture of teaching / learning in UCA, we are going to look at the planned actions to deal with these constraints. Certainly, digital technology can't stop keep progressing but will play a big role in an innovative approach that will help to reduce these difficulties. The pedagogical aspect stays the key element to drive every change.

V. TECHNOLOGICAL ASPECT

Equipping students is one of top-priority steps. Though it is insufficient and plays a risk factor for many African innovations. At UCA, a survey [4] has been conducted in 2015, examined about 400 students, a part of it aimed to determine students' profiles, their environment and the nature of their current use of ICT in education. This study's results revealed that more than 2/3 of students have access to a computer or a Smartphone but only 40% have Internet access. In order to democratize Internet access and as described earlier UCA has implemented high bandwidth Internet network with the latest Wi-Fi technology so that it can be reached by almost every part of university's areas. The project aims also to setup learning platforms and applications available to students that facilitate collaborative work and improve productivity. It goes without saying that these services are free to use by students. The open access establishments at UCA are counting more than 400 workstation computers each, implemented in free service digital reading rooms. University's investment in technology equipment was part of a global strategy and became a necessity for the development of UC@MOOC initiative.

Today, UC@MOOC platform offers 318 videos of more than 60 courses. Also, some supervised works, laboratory activities and conferences, which are posted online freely. Technically, the audiovisual production is relatively easy and doesn't require an expensive material. Over the life of this project we have been trying to simplify the production process and to reduce the length of videos without losing neither information nor efficiency.
Three studios of about 24m^2 each contain the basic equipment's that listed below:

- Green-screen for embedding PIP (picture- in-picture).
- five light sources for enlightening both background and teachers.
- A semi-professional 16 MP HD camera.
- An UHF mono-directional tie microphone (256 *kb/s* broadband).
- Two High Resolution Flat TV screens (one as TV prompter and another one for monitoring.

Video editors and post-production equipment's are also installed on studios. It includes a high performance computer PC with two screens and equipped by Adobe Premiere and Camtasia Studio.

The produced videos are eventually put online for a non-restricted access on YouTube. UC@MOOC platform organize the presentation of these videos and offers a filtering by establishment and disciplinary field.

Many approaches and teaching situations with many configurations have been tested and used by professors during digitization of courses. In studio, the professor is free to take the position that fit him the best in a specific area within the camera's reach (seated or standing) with a slideshow incrusted in the background.

It is also possible to record a dialogue between students and their teacher. We have also used optical microscope for biological experiments.

Several other situations, out or inside the studio, have been tried (Laboratories, classes, etc.).

A graphic chart was created especially for UC@MOOC productions. This graphic chart is now the main model to use for every new course digitalizing. Functional and ergonomic aspects of the platform were softly taken care of in the purpose of enhancing eligibility. The text fonts, size, colors and illustrations are making a solid relation between web page and videos. The slides hows of the filmed courses were also adapted to this chart before they went included in videos.

VI. PEDAGOGICAL ASPECTS

Certainly, MOOC initiative has emerged in a short time in the educational landscape and is now considered a new source of a performing teaching / learning situation. The diversified covered subjects and the open access constitute an efficient advantage for broadcasting information and for long life learning. The widely shared opinion is that they have the potential to revolutionize tertiary education. However, many actors [5] are observing some limitations on their cases of MOOCs.

Firstly, the adopted teaching method -except some rare cases- is transmissive, vertical and far to focus on learner. The weakness of interactions and evaluations are also noted, along with their consequences on the motivation of learners and the strong students drop rate. In fact, under the threat of drop rate, a MOOC demand from students a serious effort of organization and motivation. In a campus, the direct contact with a teacher, collaboration with other

students of the same class remains an important challenge in university curriculum.

The specified period (a few weeks) to a MOOC to be open at a specific date can also be a limit, which can be in general inconvenient for a public that has different agenda. Ultimately, for a student, successfully following a MOOC doesn't apply for getting an international recognized diploma or certificate. Generally, MOOC's contents do not match the ongoing programs, which can dissuade students to spend their time on them.

In that capacity, we need now to know, for tertiary education, how the most current typologies of MOOC are adopted or not, and if, when university's public is targeted, it would be possible to jump partly from face-to-face in learning?

To resolve these limits, and without overlooking university's constraints, the choice that was made at the launch of UC@MOOC initiative was to implement a platform to put online audiovisual pedagogical resources with the same contents presented in university in face-to-face of the same professors. Based on these resources, the professor has the choice to adapt his own face-to-face approach where he can profit of the fact that students already watched his course so he can answer their questions.

Students are able to viewing these resources as many times as they want through Internet access, but there are also a DVD supports, that contains this same resources, available to students since the start each semester to ensure a non-restricted access to these filmed courses. Our study showed that 7% of students uses DVD supports. Recently, an Android [6] application is designed by UCA and it provides to navigate through these audiovisual resources.
Since the first days of UC@MOOC, Smartphones made initiative an average of more than 12% of viewing rates.

VII. CASE STUDY: DISPLAY AND ANALYSIS

Mechanic's course of material point, enrolled in the project and presented at UC@MOOC corresponds to the program of the first semester (S1) for the license - option material sciences for physics and chemistry.

In what follows, we are going to expose the data related to the online videos access of this course and we'll proceed to the analysis.

This course is presented in face-to-face with duration of 24 hours during S1. While being filmed, the course was divided into 14 videos, depending on chapters, with a total duration of 8 hours and 26 minutes, which is approximately 1/3 of face-to-face duration. In fact, while recording, the professors act faster, rarely repeat or reformulate an idea and don't get interrupted by the questions of students.

Figure 3 shows the evolution of viewing between 2013 and 2015 of the mechanic's course of material point at UCA.

This course was one of the first courses posted online at UCA in November 2013. The total viewing duration reached 79.751 hours of lecturing by the end of August 2015 (in 21 months) along with 825.336 views. Most visitors (69%) are from Morocco, Algeria (10%), Tunisia (6%), France (5.8%) and Senegal (2.4%). In fact, more than 91% of viewing rate was achieved from Africa. The number of subscribers in this course is 2.792, it got 2965 likes and 92 don't like. Its videos are integrated 1.896 times in other channels and have been shared in social networks and mailing lists 2.736 times.

A. Identification of the main users:

Figure 3 shows the viewing rate of this course to this time. From what appears on the graph, each year there is a sharp increase of the number of visitors from October to January, that is the same period of presenting the course at UCA, from which we can move on with the hypothesis that the main public visitors are essentially formed by CAU students.

To strengthen our hypothesis, let's take the age group of students 18-24. In North Africa it forms 70% in Morocco and 67% in Tunisia if we relate to these two countries only. 75% of the subscribers of these videos belong to this group. On one side, if we retrace the second figure specifically for Moroccan users we can get it in details for each video. It will appear that the maximum number of views of each video will stay the same at the same date where the corresponding module has been started in face-to-face at UCA.

What happened to Tunisian users? The maxima of viewers is related to the progression of module but there are two of them, the first is allocated in mid- October and the second in mid-January that happen to be the same period of exams in Tunisian universities.

We can conclude that our principal users are effectively two targets. They are essentially students at UCA and those of the francophone countries, geographically neighbors. Our study showed that students find the explanations of professors are very fast. They also estimate that UC@MOOC initiative a useful complement to their courses. They are also able to freely repeat parts of a video, suspend it while searching for a signification, translating a word or completing some particular knowledge.

B. Audience fidelity:

Another important parameter of our analysis of users is the time spent to watch a video. The average viewing length of videos is not serving our study when it doesn't exceed 1 minute. For this module, most statistics stay interesting for this study.

We propose to analyze the percentage of users that fully watches the videos. This parameter is presented in the figure below for 14 videos.

Figure 4 shows a percentage of full watch rate based on video duration.

This figure introduces a commonly admitted hypothesis. More the video is long the less it gets viewers to watch until the end. The percentage of full viewing is amounted to 15% for a 9 minutes' video, considered the maximum duration allowed for a video by Khan Academy [7] and many other

MOOC portals. Exceeding 9 minutes, it appears that decreasing of this parameter is shown in levels: from 10 to 30 minutes it is about 11%, and decreases down to 6% for 30 to 60 minutes' videos.

C. UC@MOOC, internationally open:
The figure 5 represents the percentage evolution of viewing rate in Morocco, and the total of the fourth countries: Algeria, Tunis, France and Senegal, from 2013 to 2016.

This figure shows that the evolution of views from Morocco decreases appreciably while it increases for all the other four countries. The viewing duration realized by Moroccan users was 83% in 2013, in 2016 it went down to 54%. In the same period, it increased from 13.2% to 35.1% for these countries. We can interpret this increase as a worldwide opening of UC@MOOC and essentially towards an African public.

D. Context of reading and source of traffic:
The analytical data indicate that almost all of viewings were directly realized on YouTube. Thus, as it is mentioned before, we have implemented a platform for UC@MOOC on UCA's servers. It offers many ergonomic and professional services and includes all the videos of UC@MOOC courses on YouTube. However, only less than 2% of our users are accessing it from our URL.

We have tried to make an easy, attracted, flexible and an organized browsing of this website. We have also implemented an extra documents related to courses including pdf course formats, professors' ppt presentation and exercises. The new version of the platform is now in its test phases and will be available soon.

The figure 6 shows the different ways used by online visitors to come to our platform. It appears that YouTube alone drains almost half of our viewers, either via YouTube search engine or home page suggestions. Seeing the figure closely, about two of three users who follow a YouTube suggestion were already viewing a video of the same course. Accessing a video by a directly entered URL, being moved to favorites, or using a shortcut constitute also an important source. Finally, accessing a video via Internet websites or mobile applications is made by 8.1% of users.

Regarding the type of devices used to watch videos, 84% of visitors are using computers, nearly all of them with Windows. And Smartphones users constitute 12%, predominantly with Android. Then, Tablets make 3.3%.
It is not useful to analyze the development of usage of Smartphones and Tablets for our African users. It serves us to get a clear idea on the evolution of equipment's and their usages in Africa. Figure 7 represents this evolution by two curves, one for Smartphones and the other one for Tablets.

The duration of the curves goes from the first trimester 2013 (T1-2013) to the second trimester 2016 (T2-2016).
Fig.7: Evolution of percentage of users using Smartphones and Tablets 2013 to 2016.

As shown above, there is a large difference between the use of smartphones and tablets. The usage of smartphones has rapidly increased from mid-2014 to end 2016. In one and half a year, the number of smartphones users has quadrupled and reached now 19%. Such a mobility of usage must be taken in consideration by optimizing the portrayal of UC@MOOC platform for this kind of devices and by enhancing the functionalities of UC@Mobile app.

The use of tablets have proven to be fluctuating and doesn't have the same progression as well as Smartphones. Because of the cost, a little bit expensive, and less performing, as computers and they are more bothering than Smartphones. For their mobility, it is more suitable and flexible to have a Smartphone than tablets, at least in Africa.

According to the evolution of the percentage of Smartphone or tablet users, for only Moroccan users, we'll get some very similar variation. We couldn't highlight a correlation of the usage of Lawhati's tablets program (Lawhati is an initiated and piloted program by Higher Education Ministry of Morocco that aims to provide tablets by an interesting cost to the students of Moroccan universities).

We will be wondering when we analyze the previous data if it wouldn't be more efficient to grant university students an access to Internet. And, on another page, these devices are fully equipped by many captors that allow making a large range of measures and scientific experiences as much us laboratory materials.

VIII. LESSONS LEARNED AND TRANSFERABILITY OPPORTUNITIES

UC@MOOC was launched on individual initiatives of a team of colleagues who agreed to record their teaching media in audio-video format with scripting, in order to provide the students with open access to institutions (Licensing round S1 and S2). Some time later, the monitoring of these courses by students of the UCA has attracted the attention of the entire scientific community of the University which found a way in this action can help address several challenges that the University faces today (massification, language difficulties, drop-out rate).

Approximately after 36 months of production and distribution, the first results are quite satisfactory in terms of interest in the platform UC@MOOC. Therefore, the production achieved to date is presented below:

- 15 conference.
- 5 full TD abbreviations in full first (several rounds of TD).
- 5 full TP as above.
- 60 full courses.
- 60 teachers researchers involved.
- + 318 course units available online.
- + 135 hours of content available online.
- + 25 current recording or wait and mount.

Finally, a total of 100 complete courses scheduled end June 2016. They started with lectures, then the tutorial with their

answers and finally the practical workof these courses. Some of this content is now offering interactivity between teachers and students els. Below is a non-exhaustive assessment of the statistical results that registers the platform UC@MOOC:

- The number of views > 2555412.
- View time > 13,832,360 *min* (≈ 26 years of viewing duration).
- The average length of viewing is 5 *min* 28 *s*.
- The shares are from 9368.
- The videos in playlists are 4.008.
- The number of subscribers is 17,248.

IV. CONCLUSION

The issue of massification in higher education is of pertinent concern in Africa. The use of distance and open learning tools provide an avenue for both access and participation in higher education.

UC@MOOC is, beyond reasonable doubt, truly an opportunity to enhance quality of training in our universities. It grants an innovative potential with the aim of experiencing some new active and effective learning / teaching situations to be adapted for students. This quest of innovation and quality is not the main resort of teachers, on the basis of that, students are taking ownership of these resources to gain independence. And we came to discover, with the help of their way of use, the most convenient use.

UC@MOOC is playing an important role of opening and leading our university, not only the students of Moroccan universities but it also continues to attract visitors from African universities but not only. And it makes easier, because its courses are open, to consistently learn for a whole different audience. Its production procedures are simple and less expansive and its positive pedagogical values grants an easily mobile tool in southern countries.

In our research stream, there is still a lot of work to accomplish, in order to run and analyze UC@MOOC initiative. At the origin of this initiative our team has adopted, since its beginning, a procedure of research-action, by joining the technological production of resources with its pedagogical realization and with the research on this thematic that has become now our priority. This multidimensionality had an effect on production volume, which didn't reach our ambitions; meanwhile, it allowed us to fully understand the complexity of this initiative and to interfere in many techno-pedagogical aspects, in a coherent manner, for the purpose of raising its quality.

REFERENCES

[1] UC@MOOC web site, <http://mooc.uca.ma>, visited on January 5, 2017.

[2] Tawil, S., Cerbelle, S. & Alama, A., UNESCO, *Education au Maroc, Analyse du Secteur*, [online pdf document from UNESCO 2010], <http://unesdoc.unesco.org/images/0018/001897/189743f.pdf>, visited on January 5, 2017.

[3] Berrada, K. & Miraoui, A., *La capacité d'accueil de l'université Cadi Ayyad face au problème de massification des étudiants, MENA Higher Education Conference, Beirut, Lebanon (My 2015)*, <http://cmimarseille.org/sites/default/files/newsite/library/files/fr/Khalid%20Berrada.pdf>, visited on January 5, 2017.

[4] Bouazaze, A., Idrissi, A., Bendaoud, R., Berrada, K. & Machwate, S., *Impact de la plateforme Uc@mooc sur les apprentissages à l'université Cadi Ayyad*, Proceeding of ICT Study days, 3rd Ed. (Al Akhawayn University, Ifrane, May 2016).

[5] Bongani Khoza, Limitations and Advantages of the MOOC model in South African Higher Education, <http://moocs.org.za/limitations-and-advantages-of-the-mooc-model-in-south-african-higher-education/>, visited on January 5, 2017.

[6] UC@MOBILE, an application on Google play, <https://play.google.com/store/apps/details?id=com.blackboard.android.central.uc>, visited on January 5, 2017.

[7] Kahn Academy, <https://www.khanacademy.org>, visited on January 5, 2017.