

# Learning Electrolysis with Podcasting in the Higher Education: From Implementation to Results



Chrifi Ibtissam, Tace Elmostafa, Radid Mohamed, Yazza Younes

**Abstract:** Our contribution comprises two major parts: the first one aims to explain how to implement the technique of podcasting within a faculty of sciences, following a well-adapted educational scenario. The second one, is dedicated to a study about integration of learning activities focused on the Electrolysis chemistry, in the form of video capsules. Indeed, 90 questionnaire were distributed to a group of students in the second year undergraduate degree, enrolled in Materials Science Chemistry, then, 30 semi-structured individual interviews were conducted with students and their teachers. The analysis of these interviews and results from the questionnaires, according to three targeted indicators, showed that the learners in the higher education are very interested in the technique of podcasting, and consider it as a suitable device for their informal learning sphere, and that the podcasts submitted by their teachers remain the most favorite for their motivation and self-learning. For their teachers, the device is a new necessary alternative to the improvement and renovation of their practices, and for the regularization of the use of smartphones in an academic sphere in order to enhance scientific student's skills. This article is part of a perspective that propose an innovative tool, which could bring more efficiency to teaching practices vis-à-vis the democratization of training in the higher education. It is a logical continuation of the research works on the relevant role of educational technologies in the renovation of the future universities, and of the positive impact on the students learning in these universities.

**Keywords:** Podcasts - nomadic learning – hybrid learning-electrolysis- higher education

## I. INTRODUCTION

According to a report presented in 2016 by the National Telecommunications Regulatory Agency in Morocco [1], the rate of equipment of Moroccan users (12 to 65 years) of mobile phones is 95%. These smartphones have become in the modern society a "revolutionary" aims to communication [2] but also for the individual practical life, thanks to the infinite number of software applications that they can integrate.

This According to the International Data Corporation statistics, the emergence of this gadget has grown exponentially in the last two decades, an emergence that has also strongly affected the environments of all educational cycles [3], [4] cited by [5]. phenomenal had been seen in the growing number of student population using smartphones in their environments. In fact, these new generations of students, called Z generations, cannot stay without their smartphones for a while, and with a connection rate that exceeds, on average, five hours a day, their daily lives depends heavily. Thus, we must rethink about the school of tomorrow, in order to use this devices in a reflexive and strategic way in educational processes [6] while thinking of a real anchoring and a real development of "mobile-learning" [7], [5] who will be able to address the different problems encountered in our university institutions, particularly in terms of time management and teaching-learning space. With the advent of web 2.0, the use of several new features offers several opportunities, ensures more interactivity and creates more sociability. This gave birth to a technique for listening, viewing and downloading multimedia contents (audio and video) on a mobile medium: it is the technique of podcasting [8]. This technique can have a great potential for learning, but also for teaching, because the content developed is accessible anywhere and at anytime for any learner [9]. Hence, the nomadic and continuous nature of learning using podcasts. Thus, starting from the pedagogical interests and the strategy to follow for our new device, we will try to approach the impact of teaching activities in podcasting on the learning process in the context of Moroccan higher education, while at the same time focusing on the uses and attitudes of students [10], but also on the transformations that can touch the teaching practices in such cycle.

## II. STUDY CONTEXT

Recently created, Hassan II University in Casablanca (UH2C), was born from the merger of two old Moroccan universities (the Hassan II-Ain Chock University and the Hassan II-Mohammedia University). A university that currently includes a campus of 17 institutions, including 11 faculties offering training in all disciplines. In addition, the UH2C, like other Moroccan universities, is increasingly facing major challenges such as massification and hard international competitiveness that requires high-level training. This university has adopted an innovative policy to lead to quality training offers, through a real appreciation of the teachings. In this context, and according to a development project, this university has strongly committed, since 2015,

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in the digital way to participate in the anchoring of the Digital University in Morocco, and by promoting the development of suitable digital platforms and applications that makes available to its students and teacher-researchers. The UH2C development project is driven by rigorous strategic actions, such as the development of distance and online learning, the support of semi-presential training and the large using of educational technologies in teaching.

This study is a part of a project, which integrates podcasts in the Moroccan faculties. The device will be tested and evaluated before its generalization for other courses offered by the university. The first step of our research will focus more on the technical-educational aspect of the device, for learners and teachers. Then, the second step will presents a study that aims to assess the interests and contributions of podcasts to learning [11] and teaching practices, and this through their integration for the module of the chemistry of electrolytes (module: CFC23504) which is a module taught in French to students in the second year of the Bachelor's degree in Materials Science Chemistry (MSC). Because of the large number of students that exceeds 500 per class, face-to-face activities for this module often encounter difficulties or even obstacles [12]. Therefore, the teachers are trying to change their "classical" methods to look for more open [13] and more professional strategies, to ensure a continuity of learning for their students, even outside the class, using the opportunities that digital technologies can offer.

### III. PEDAGOGICAL INTERESTS OF PODCASTS

Podcasting has a technical definition and another literary [14]. In 2013, reference [15] defined this technique as an audio and / or video file published on the Internet, and downloadable on a computer or mobile through a subscriber - RSS feed - for later listening or viewing. It is a relatively simple tool of use, but the thing which could provide important benefits for adult learners in education and training [16]. In this sense, [17] emphasized that it should anchor the best teachers practices and effective learning, because the students can be included directly into their learning [18]. Thus, this tool can produce different effects, which concern the production of knowledge, the perception of the learning process, the professional development, the intentions of uses, and learning or teaching practices [19].

Starting from these observations and introducing the typologies of usage proposed By [20] in 2005, we can recapitulate the pedagogical interests of such device as follows:

- For the student: individualize learning, facilitate the assimilation of content, vary resources, overcome absenteeism, become more active in producing its own content.
- For the teacher: to self-evaluate and improve practices, better manage the time and space of teaching, motivate students, ensure continuity of learning.
- For the university: to produce quality contents, to valorize teaching and to make sure of their attractiveness with the students, optimize the yield of the teaching, to treat the problem of massification.

### IV. TECHNICAL SPECIFICATIONS OF PODCASTS

To create and distribute audio and / or video files on a website

or a blog, all what you have to do is have a few computers available: computer linked to the internet network, storage and reading tool and some softwares. In this section we will give the necessary skills for the implementation of Podcasting:

1. Schedule and Control audio / video recording of the activity presented with specified software (Audacity, Garage Band, Soundtrack Pro, Windows Movie Maker ... etc)

2. The Podcast being saved on the computer, the next step is to add the RSS 2.0 text to the MP3 (audio) or MP4 (video) file, which converts it to a Podcast: The first method is to add a XML file script to the html file of the website. Another method is using applications, which provides a space to enter information and descriptions about the Podcast, including its URL, date, title.

3. Users who want to consult the file must subscribe (free of charge) to the feed, and they will automatically be notified on their computers or smartphones of the availability of a new episode. Subsequently, he can download and manage all episodes on a mobile device (the smartphone) to watch them after.

### V. PROPOSAL OF AN EDUCATIONAL SCENARIO

The objective of our device is to approach the concepts related to the production and storage of electrical energy from the analysis of certain chemical solutions (electrolysis), and which show real learning difficulties: students must concretize the theory of the equations of reactions of the oxidation-reduction for an application of the daily life; namely electrochemical cells. All the practical work proposed in this direction to bring students to establish the link between theoretical concepts and concrete application. So all the interest consist in implementing our digital device through a predefined scenario to fulfill its pedagogical function [21]. The approach proposed here for our podcasts is based on the model given by [9]:

1. Choice of concepts: reaction, oxidation, reduction, electrolysis, anode, cathode, potential, energy, battery;
2. Problem situation: A spontaneous chemical transformation involving an electron exchange can take place either by mixing the chemical species of two oxidant / reducing pairs, or by separating them; in the latter case, it is shown that the corresponding transformation is used to recover energy in the form of electrical energy using a device: the battery;
3. Structuring concepts:
  - Electrolysis (principle, cell, potential scale);
  - Battery (definition, batteries, accumulators);
4. Development of each concept;
5. Planning: Propose to the students to carry out in a group, a pile with the means put at their disposal and to film all the stages of the experiment;
6. Comment on the experiments;
7. Podcast Test: Quality, Format, Timing;
8. Registration and distribution on the faculty website;
9. Evaluate the Podcast.

### VI. METHODOLOGY

The Faculty of Sciences Ben M'sik-Casablanca, has launched in recent years in online training, including MOOCS (Massive Open Online Courses),



which require a permanent connection of students to benefit. Podcasting, with an advantageous nomadic character, remains a new technique for scientific faculty members, and the large majority of them have never used it before, despite its wide use by other educational systems. International. Many examples cited by [22] show the great interest given by several countries to this technique. So to investigate the effects of integration of podcasts in Morocco, we have introduced several video clips of the various activities (lectures, exercises, practical works) of the module CFC23504. The choice of this module is taken as an example for a scientific discipline where massification intervenes strongly in the action of university teaching-learning (more than 500 students enrolled). The video clips were filmed in real time for a whole semester with a professor belonging to the faculty mentioned above, then put online using a site specially designed for the podcasts of this faculty. Our goal is to focus on interpretations related to the individual uses of students [10], but also to the opinions advanced by their teacher [19] on the technique of podcasting. Thus, after integration and use by the subjects, surveys were distributed to a group of 90 student from the second year undergraduate degree in the Sciences of Matter Chemistry. Then, semi-directive individual interviews were conducted with a heterogeneous group of 30 student and their teacher. These students belong to different social classes, and all have a smartphone which they perfectly master the manipulation of features. The process of questioning was carried out during a period when there were no examinations, so, the attitudes of using are not influenced by the evaluation conditions (massive use for the preparation). Finally, the results of the surveys and the answers of the interviews were followed by analyzes and complete exploitation of the contents [23].

Indeed, these were intended to interpret the results of these answers [24] according to three indicators directly derived from the work of [25] and those of [5]: the comments of the interviewees were interpreted to identify the different individual forms of using, the non-use factors, and the changes that the practices of each student and the teacher have undergone after podcasting.

### VII. OBTAINED RESULTS

To obtain the opinions of the subjects, we opted for direct and well-targeted questions in order to avoid any confusion or ambiguity during the answers. This allowed us to clearly identify and exploit the figures for the indicators, and to rewrite the interview texts to highlight the redundant terms that are closely related to our indicators. In addition, we remind that the answers concern the group of students and their teacher. In one hand, the first indicator for students was the need to use podcasts, and all of the answers were directed to individual learning, or what we might call use in an informal learning. which is specific to each learner (use in their personal learning environment). Then, we asked about the limits of such technique with regard to the teaching-learning process, and the statements are divided into two dimensions: a didactic dimension (all that is related to the use of documentations), and answers of technical dimension (all that technical problem of the device). In the other hand, the last indicator that was of interest to us is the changes that users' practices may sustain, including the transformations that result. Thus, all the results are summarized in the following table:

**Table- I: Answers to topics about the podcasts usage**

Topics	Subjects answers E+P	Percentage of Redundancy	Indicator detected
What is the purpose of using podcasts?	Review the course to better assimilate.	98.51 %	Used in the context of informal learning.
	Overcome the difficulties of some exercises by looking at the procedure followed in class.	80.32 %	
	Appreciate a new method to learn using the smartphone.	95.00 %	
What can you prevent from supporting your learning on podcasts?	Face-to-face activities are essential.	70.74 %	Not used for teaching-learning
	Satisfy written documents available.	16.23 %	
	The videos occupy an important smartphone memory.	28.15 %	
	Use divergent smartphone.	51.60 %	
What has changed since you used the podcast technique?	The smartphone has become an important source of knowledge.	85.45 %	Induced changes in user's practices
	More responsibility and more autonomy in learning.	90.03 %	
	Facility of teaching-learning	91.65 %	
	Reduction of concerns related to the face, time saving	82.77 %	

### VIII. DISCUSSION

Although the technique of podcasting is new for the Moroccan educational system, the figures relating to its use are significant, this explains the fact that the students appreciated the nomadic nature of the technique, and that they are motivated to technology widely used in their daily lives: they want to discover the most profitable facets for them and the most appropriate methods of using, to integrate as much as possible in their learning strategies. Reluctance to

change seems to be lacking, as these "adult learners" have not declined the new device especially when it is considered complementary to the activities of the face-to-face, or to the traditional teaching tools. From a practical point of view, the figures show that students can manage their learning at their own pace and become autonomous in their training.

These results confirm the findings of [25] especially for the reasons of the use of podcasts.

On the teacher's side, our experience has shown his total commitment to filming his sessions and "archiving" them as episodes, that will be made available to students. He notes that the face-to-face can not guarantee the achievement of the objectives of the curricula, especially face to the large number of people who are growing from one year to the next. Podcasting was beneficial to him on the one hand, in terms of time management: instead of repeating the explanations several times, he explains once without worrying about the differences between levels of students (he knows in advance that the episodes will be downloaded and seen later for better assimilation). On the other hand, in terms of professionalization: by viewing his podcasts, the teacher detects the improvements that he must bring to his practices in the near future. This teacher emphasizes that it would be better to introduce the functionalities of mobile phones into an institutional framework, to teach new generations, and at the same time to orient their usage towards the right learning strategies.

## IX. CONCLUSION

Throughout this paper, the comments of teachers and their students have been generally positive about the technique studied, namely podcasting. In fact, students are highly motivated, and their teacher is open to the mobile learning.

With this innovative tool, nomadic and very cheap, the learning of our students, via their smartphones, can be flexible and improved; this can only promote the level of our faculties in the digital world. It would be a shame for the Moroccan education system to miss it. We also have indicated in this study, that podcasts will be beneficial for the main actors of higher education institutions (teacher-researchers and students); their generalization would certainly bring a *plus-value* to the learning of large number of students and will condition the use of smartphones in the classes of the faculties, instead of completely banning them for future generations of students. Teachers can also have their share of self-development using this tool: they can review their filmed sessions to detect areas of weakness, and try to improve their teaching practices as soon as possible. Furthermore, the podcasting technique must be integrated according to well-structured scenarios and more open and innovative pedagogical approaches.

If the appropriation of podcasts for the teaching-learning process is widely advised, it would be absolutely wrong to think that they will completely replace face-to-face activities. The policy of their integration must absolutely assume them in a framework of hybrid learning.

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