



MOODLEBOX: A NEWLY CONCEIVED MOBILE POCKET PLATFORM FOR MOBILE LEARNING

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ABSTRACT

Background: The strategy of the Moroccan educational ministry, adopted to insure good conditions of teaching-learning practices, focuses the generalization of technologies of information and communication TIC use in education, as pedagogical and didactical means of dynamic and active learning. The e-learning via internet is the most used to connect isolated regions and to overcome issues related to the learners' mass. But some problems related to the internet coverage and deployment yield persist. **Objectives:** this paper provides a future vision of a newly conceived Moodle device use, offering thus to the learners a mobile, local and digital workspace without the need of internet. **Material and Methods:** A MoodleBox device, with a Raspbian-Linux exploitation system and connected to the learners' mobile devices, was used to generate three scenarios of the nomadic MoodleBox platform use in different contexts: in classroom, in common scholar spaces and during field trips. A feedback activity, by using the Moodle application, was performed by trainee teachers of Life and Earth Sciences in the "Centre Régional des Métiers de l'Éducation et de la Formation CRMEF" of Casablanca. **Results:** The use of the MoodleBox device, connected to the learners' mobile devices was very helpful to plan and manage three scenarios of the nomadic learning management system and to test the MoodleBox usefulness by running the feedback Moodle activity in class. **Conclusions:** The preliminary results of the MoodleBox platform use are encouraging and the possibilities offered by the newly conceived tool significantly improve the teaching-learning conditions. Further detailed studies, related to the operating capacity and diffusion coverage of the MoodleBox, are demanded to profit from this nomadic device and foresee the ways of its development.

Keywords: MoodleBox, Nomadic LMS, mobile Device, BYOD approach, Pedagogical scenario

1. INTRODUCTION

According to the "Agence Nationale de Réglementation des Télécommunications" (ANRT, 2015) [1], there were 43 million mobile devices in Morocco in 2015, for 33.8 million inhabitants. In addition, the UNESCO announced the organization of the mobile learning week for the year 2017, which advocates education in emergency or crisis situation, and declared that mobile phones are the common rare objects available to the moving people. In North Africa and Middle East, this united nations organization considers the Smartphone as a vector of change during this decade [2,3].

It is no longer necessary to prove that the digital connected objects have become part of our existence and our lifestyle. They have almost become compatible grafts! The philosopher Michel Serres, called today's learners of "small thumb", because of their skills to do everything with their thumbs, on the interactive screens of their mobile devices (Serres, 2012): write messages, Communicate, get informed, share, pay the bills, make purchases and others [4]...

But in education, the use of mobile tools in the classroom is usually perceived by teachers and institutions as a provocation and distraction way [5], justifying thus their prohibition in schools [6]. This situation will probably persist as long as there are no real successful experiences to share on this subject or plausible scenarios of mobile devices use, which may induce stakeholders to consider their integration in education and training activities as suggested by the approach "Bring Your Own Devices" (BYOD).

The generalization of the Information and Communication Technologies ICT use in education constitutes a strategic measure to improve the conditions of teaching-learning in Morocco [7,8,9] and provide the opportunity for a dynamic and interactive learning [10,11]. In a meta-research aimed at assessing the impact of the effective pedagogical integration of the ICT in education, Barrette (2011) highlighted three interrelated positive aspects of ICT use: (1) an increase in the learners' motivation and interest indicators, (2) an increase in quantity and quality of cognitive operations, (3) an improvement of academic results [12].

Faced with these realities, the question whether Smartphones will continue to be ignored and proscribed within schools raises. The alternative options is to consider that it is high time to think of incorporating them and creating conditions favorable to their proper integration in education as suggested by the French "Comité de Valorisation de l'Enseignement" [13]. On the other hand, Tablets are relatively better perceived as educational tools, even if they do not present any notable peculiarities of functionality, compared to Smartphones. The learners' mobile devices can have a significant role in their own learning. This is conforming to the declaration of the UNESCO (2012), considering that the use of mobile devices will allow the learners profit from the societal realities offered by the mobile devices [14]. In addition, the UNESCO recommended that educational policies should require, wherever possible, that educational content be accessible on mobile devices [15, 16].

The objective of this article is the implementation of a newly conceived MoodleBox device, through the planning of three scenarios of its use for the training of the future teachers of life and earth sciences in the "Centre Régional des Métiers de l'Education et de la Formation" CRMEF of Casablanca. The contexts of use were: (1) the use in classroom, (2) the use in the common spaces of the training center, (3) the use during a field trip. The test of functionality included the execution of a Moodle feedback activity. This work therefore constitutes a futuristic view of the MoodleBox device use, which offers the learner a local and digital workspace, secure and mobile, without the need for the Internet.

2. MATERIALS AND METHODS

In the spring of 2015, during a discussion in the Moodle Francophone community forums, Method had thought and posted: "... a local Moodle in hand, in the pocket or on the table insuring diffusion in a classroom ... the idea of a small box on the table that will deploy Moodle to the whole class has something magical ... " [17]. Today, with the MoodleBox, a handheld mobile platform is on the table. It is capable of deploying a learning environment locally, even in regions far from any network infrastructure [18].

The apparatus used corresponds to a MoodleBox device with a Raspberry Pi3 card [19], on which is installed a Raspbian Jessie Lite Linux web hosting server and a Moodle learning management platform, using a micro-SD memory card of 32 GB. Each usage scenario required the choice of the work domain, whose configuration and parameterization allows the appropriate use, according to the objectives aimed at the integration of the MoodleBox connected to the learners' mobile devices. The name of the work domain constitutes a form of guidance for the learners so that their personal devices recognize the different contexts of use. The software used is under an open source license and the device used is as small as the Smartphone, capable of deploying a digital working environment, interactive, controlled and secure in a classroom, via its proper Wifi network and without the Internet need. Since it operates under a power supply of low voltage 5 Volts, using a "powerbank" battery, the MoodleBox is thus autonomous and nomadic, anywhere and anytime (Figure 1). A Moodle application for mobiles is equally available free on the Play store or Apple store.



Figure 1: A MoodleBox device with connected Smartphone.

The method adopted in this research consists in the installation of a training platform on the mobile MoodleBox device and its configuration to be used for the future teachers training in classroom, in common spaces of the formation facility and during a field trip. To implement the MoodleBox platform use in class, the Moodle feedback activity was

simultaneously carried out by thirty trainee teachers. There were three classes with thirty participants in each, which tested the same activity.

In terms of user guidance and device configuration, we configured the MoodleBox so that it can be identified on the local network by assigning to each type of use a name of Area. For the same MoodleBox, it is thus possible to switch from one mode of use to another, by a simple permutation of Micro SD memory cards, integrating the different configurations of the modalities of use.

3. RESULTS AND DISCUSSION

Among several examples of possible and plausible ways of MoodleBox use, as a newly conceived mobile platform device, we present in this document three different tested cases related to education and training purposes. These modalities of use are intended to meet specific educational needs in varied spatial contexts.

3.1. MoodleBox as a teacher personal tool in classroom

In the first scenario of use, the configuration is done by attributing a domain name specific to the teacher, who is the administrator of its class platform. The teacher uploads his pedagogical paths on the platform and manually enrolls all the learners of his classes by their own authentication accounts. After the implementation of the scenario we were able to conclude that with a personal MoodleBox, the teacher is able to diffuse his own digital work environment, in the classroom. This digital space allows him to support in face-to-face and digitally, the implementation of his lesson. Indeed, a toolkit, organized in various resources and activities, is helpful for developing educational paths that are very specific and adapted to the needs of class groups. Subscription to these courses is thus imposed by the teacher and is therefore compulsory to all of his students, via authentication accounts, secured by a password.

Besides the benefits of classroom practice enrichment, the flexible use of the MoodleBox environment offers the learner the possibility of download his activity tasks, on his own mobile devices, that can be realized even in offline mode. The learner's production is synchronized and thus retrieved on the MoodleBox after its upload from the mobile devices of the learner during his next authentication. Consequently, the use of such mobile environment insures the spatial continuum of learning, in class and outside the class.

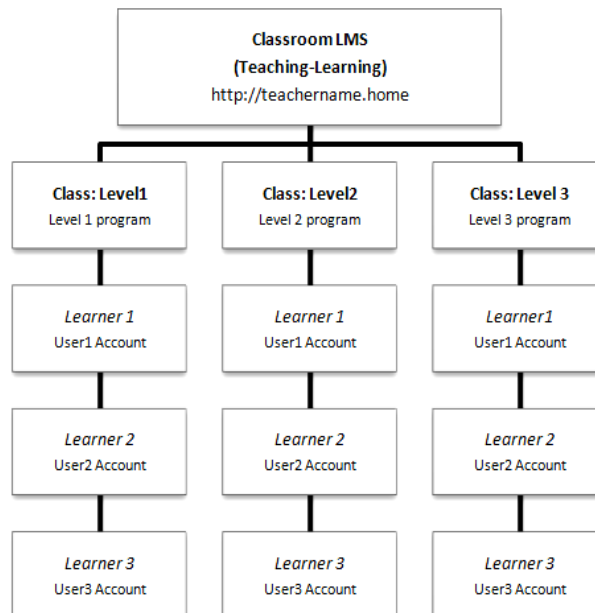


Figure 2: Scenario of the MoodleBox integration as a classroom tool.

3.2. MoodleBox as a tool of self-evaluation and pedagogical support in common school spaces

For this modality of use, the MoodleBox is configured to be identified on the local network by a domain name revealing the discipline and educational contents of teaching. The prior configuration of the platform, by the administrator, offers the learners free access to the learning paths by simple self-registration. The MoodleBox platforms are thus specifically designed to meet the needs of self-learning and educational support. They are, therefore, of a disciplinary nature (Life and Earth Sciences, Mathematics, Physics and Chemistry, Languages, History and Geography ...) (Figure 3). The

management of the platform can be delegated, at will, to one or more tutors. Self-subscription in these disciplinary platforms and access to pedagogical support and self-learning are left to the learners' will, following their needs and their degree of commitment in schooling.

The absence of dedicated tutors, that daily animate and follow these open spaces, requires the adoption of automated learning paths with: reorientations, appreciations, comments and immediate feedback. The collection and interpretation of historical data and activity reports, produced by the subscribed learners, facilitate the identification and appreciation of the learners' needs and the assessment of the impact of educational paths offered to them. This way of the MoodleBox use as a pedagogical support platform, during the school year, guarantees the mutual sharing of courses and provides pedagogical support, continuous in time, to all the learners.

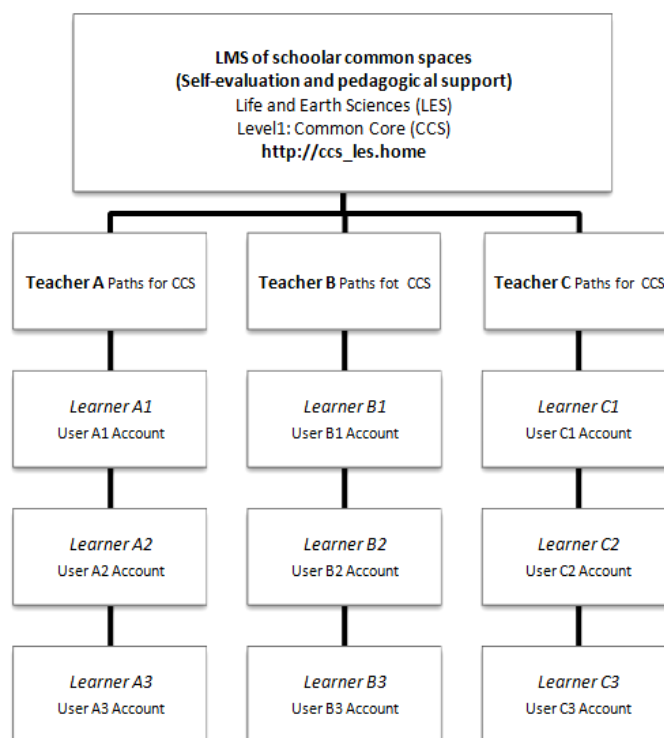


Figure 3: Scenario of the MoodleBox use as a pedagogical support tool in scholar common spaces.

3.3. MoodleBox as a companion tool outside the school

With the exception of the domain name that should reflect its purpose of use, the configuration of the MoodleBox is similar to the first model. Nevertheless, additional installations of third-party plug-ins [20] allow the teacher, if necessary, the possibility to integrate non-standard animation activities on the MoodleBox. It can be concluded that the nomadic aspect of the MoodleBox platform finds all its meaning. During a field trip or a museum visit, for example, the platform is able to provide learners, through their mobile devices, with the necessary resources to carry out their tasks (access plan, instructions, data sheets, maps, photos, videos ...). Users can also take advantage of the applications that can be installed on their Smartphones such as Geographic Positioning System (GPS), Maps, Google Earth, Compass, Dictaphone, Camera and others. These possibilities are helpful to create animation activities adapted to the objectives targeted (Figure 4). In the case of a geological excursion, for example, the building of learners' abilities and skills in applying knowledge can be targeted as pedagogical objectives, through achieving tasks such as : recognizing and taking pictures of rocks or tectonic deformations, description of outcrops and geo-locate them on the map and finally, uploading the productions on the nomadic MoodleBox platform.

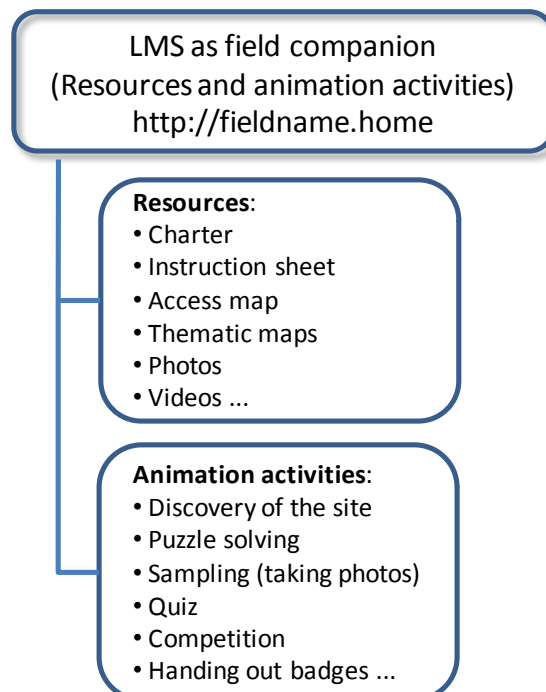


Figure 4: The figure shows the scenario of the MoodleBox use as a field pedagogical companion.

3.4. More advantages of the nomadic platform

The MoodleBox platform as a new pedagogical and didactic device is able to provide the teacher with local deployment of his own digital work environment, through a secure area accessible via the wireless network independent to Internet service. In this virtual space, the teacher can provide the learners with a database of diverse and varied digital resources (audio, video, image, scorm, pdf file...) that are indefinitely reusable. They can be integrated into the MoodleBox, by the use of a Raspberry Pi3 MicroSD card, or accessible via a USB key. Therefore the resources can be consulted and possibly downloaded by the learners as they progress in their learning. In addition, teachers are allowed to install the plug-in needed following their specialty. Such possibility is not always available on institutional platforms. The nomadic MoodleBox fully covers the four categories of the educational platform functions described by the model of Bétrancourt (2007), namely: (1) Storage/Reuse, (2) Visualization, (3) Communication/Collaboration, (4) Automatic processing [21]. The study conducted by Karsenti and Fievez (2013) assessed the impact of the touch devices use on the learning in Quebec, using questionnaire information from 6057 learners and 302 teachers. It was concluded that the use of touch pads in the school context has many advantages, there are 15 positive points enumerated, that were highlighted by both learners and teachers [5].

Appropriate evaluation of teaching-learning processes is very helpful to ensure the relevance of teaching practices. Compared to the usual classroom uses, the platform multiplies the possibilities offered to the teacher through varied activities designed to carry out evaluations. Indeed, the teacher makes a self-criticism of his teaching practices and his pedagogical choices, by using the options of consultation, survey, feedback and others. He is also able to evaluate the quality of the students' learning by different types of evaluation: diagnostic, formative, summative and recently by a certificating evaluation, that is possible by the skill repository plug-in. Evaluation activities can be varied: standard or peer-based, automated or manual and by scoring or rating scales. The automation of corrective tasks, the scoring and appreciation register, and possibly their graphic illustration (figure 5) that the Moodle application offers, constitute valuable tools for the teacher to make decisions, in relation to the support activities as well as to his pedagogical and didactic choices.

There is no doubt that the nomadic MoodleBox platform offers solutions to many technological problems, but what matters most is the quality of the teaching scenarios that the teacher can develop using this new device. In this sense Bétrancourt (2012) declared: "As with any digital medium ... indeed the quality of the tool ultimately depends on the efficiency of its uses" [22]. However, we mention two limiting aspects of the MoodleBox use, which should be explored further and taken into consideration for optimal use. The first aspect concerns the limited size of the physical memory of the MoodleBox; in particular that of the Micro-SD card that was 32 GB for this study, although the installation of the operating system occupies less than 3 GB. Opting for an external repository of big-sized resources, on USB keys for example, was revealed helpful to overcome the memory size issue. The second aspect depends on the processing limits of the MoodleBox Central Processing Unit CPU, which will decide on the number of synchronous learners using the

MoodleBox (30 participants are tested for this article) and also depends on the type of activity started on the Moodlebox system (Quiz, Video, Chat ... etc).

3.5. An example of classroom activity realized with the MoodleBox

In the context of the initial training of future teachers of life and earth sciences, at the CRMEF of Casablanca, Morocco, teaching simulation sessions were realized by the trainees (Table 1). These are simulations of professional situations that consist in the presentation of a lesson sequence. They enabled the trainee teachers to test their ability to implement lesson plans and to argue their pedagogical and didactic choices.

Table 1: Table presents the description of the teaching simulation activity scenario.

Activity	Presentation of a lesson sequence
Targeted population	Nanty trainee teachers of Life and Earth Sciences (30 trainees were participating to the activity simultaneously)
Activity Process	10 minutes: Presentation of a lesson sequence 05 minutes: Filling the questionnaire by all the participants 15 minutes: Discussion of projected results of analysis and assessment of comments and recommendations to improve the trainee practice
Evaluation	Performed by the trainer and the peers by using the MoodleBox feedback activity Evaluation is anonymous Results are immediately displayed to all participants on the MoodleBox or projected by data show medium
Reflexive analysis	Conceived for an auto-evaluation The trainee checks the remarks besides detailed results of the feedback activity and the video record of his intervention.

After each presentation of lesson sequence, an immediate evaluation is carried out by the trainer and peers, up to 29 participants. This was possible by using the Moodle's feedback activity module, based on a questionnaire that allows the trainer to create a personalized grid-based evaluation, elaborated conformably to the targeted objectives and previously discussed by the class group. The MoodleBox helped to collect and illustrate the various types or response, such as multiple choice, short answer or free composition given by the participants (Figure 5). The latter option was programmed to collect the comments of the participants and possibly their recommendations and suggestions to improve the peer's practice. This is, therefore, a feedback activity that has been parameterized with anonymous answers. Equally, the results are immediately displayed to all the trainees and trainers. To facilitate reflexive analysis of the trainee's practice progress, the trainee receives all his scores as well as detailed data concerning the evaluation activity and possibly the video record of his lesson sequence presented.

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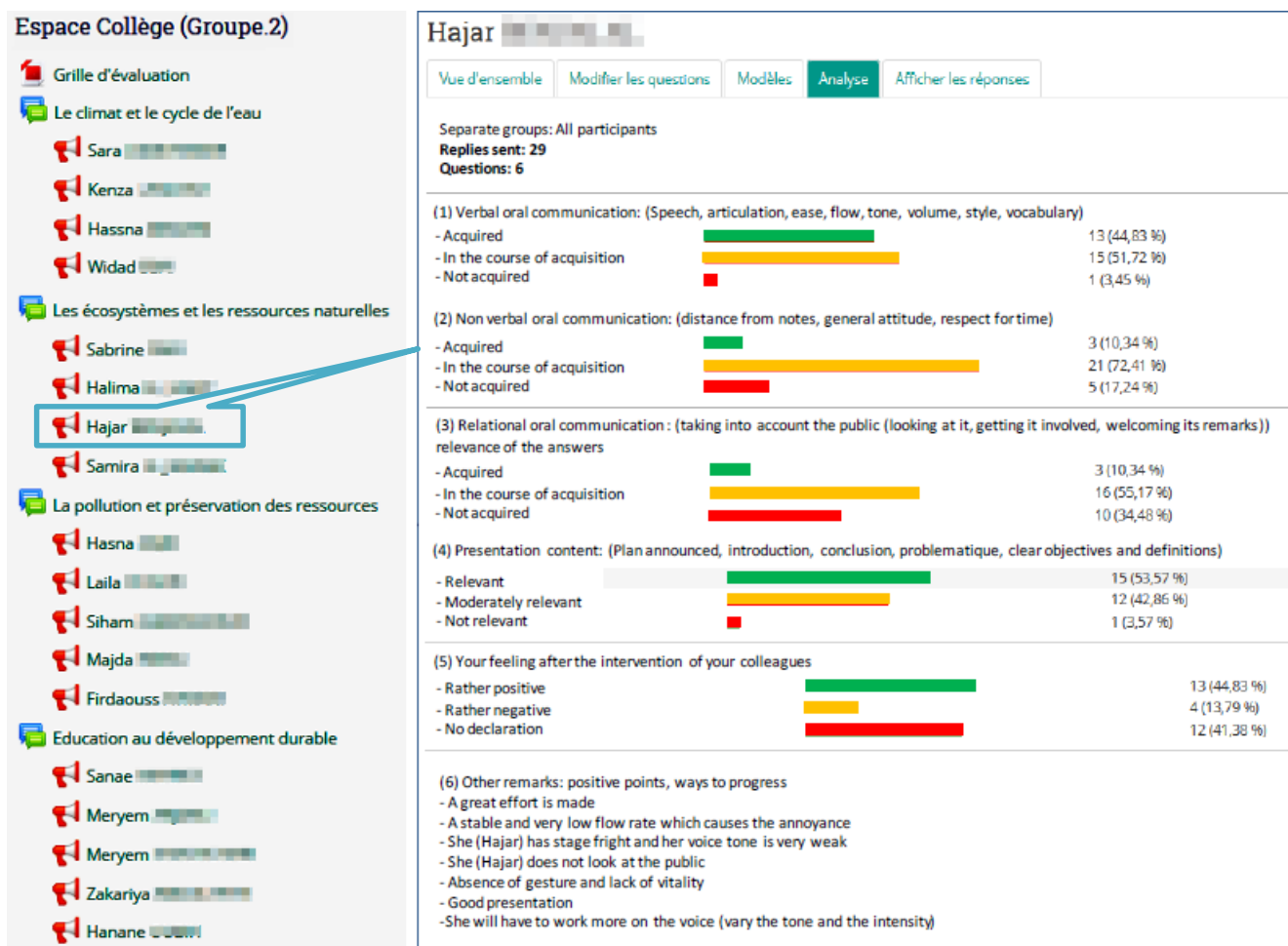


Figure 5: Example of the data analysis results after a Moodle feedback evaluative activity performed by the peers. The bars correspond to satisfactory conditions (green), moderately satisfactory conditions (orange) and unsatisfactory conditions (red). The rate of each category is given by the length of the bars and the percentages displayed on the right.

4. CONCLUSION

The first results related to the use of the MoodleBox platform and learners' mobile devices in the classroom are encouraging. This newly conceived device is able to provide, both teacher and learner, with a Moodle digital work environment, local, nomadic, autonomous, secure and without connection to the internet. These advantages are helpful to overcome many of the problems facing the schools. They, indeed, facilitate the generalization of ICT use in education and reduce the alias related to inadequate equipment and internet service. The MoodleBox platform makes the management of classrooms with large numbers of learners easy. It equally reduces the issues related to the lack resources of the maintenance and management of technological logistics...

The observations gathered, during the implementation of the Moodle feedback activity, helped to highlight the personalization of the evaluative pedagogical action as well as the multiplication of the activity time for each learner. Indeed, the learners all had the same time and the same conditions to interact equally with the same pedagogical content. Such innovative and enriched approach is able to further consolidate the commitment of learners in their own learning by increasing their productivity significantly. Indeed, with the nomadic MoodleBox, the learner is incited to appropriate his virtual learning space on his own mobile device, which he has to maintain with a spirit of challenge to his peers.

The archive of activities carried out by the learners provides the teacher with a valuable database that helps him to establish, for each of the learners, a learning progression file giving thus the possibility to appreciate the degree of engagement and detect any potential risk of failure or abandonment. Nevertheless, the teacher is first forced to discover the possibilities offered by the new nomadic MoodleBox device and to re-adapt his scenarios to integrate, gradually, this new digital dimension of management of teaching and learning processes in classroom and outside school.

Our future objectives consist in performing tests, based on the number of learners in synchronous action and the teaching scenarios types used, to define the operating conditions and limits of the MoodleBox use and also the prospects

for its development. In addition, the test of this device in educational institutions is desired to validate the results of this research and contribute to the enrichment of innovative educational practices in Morocco.

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