Design and Implementation of a Distance Training Device of Physical and Sports Education's Future Teachers: Application of Addie Model

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Abstract

Distance learning has largely infiltrated several higher education institutions in Morocco driven by the expansion of opportunities offered by information and communication technologies such as ODL, MOOC, SPOC. However, countless challenges continue to hamper the design, implementation and evaluation of these devices in education and vocational training for desired effectiveness. The aim of this study is to design an ODL system based on the SPOCs model which aims to develop professional skills for 70 future teachers of Physical and Sports Education.We have used ADDIE model as a methodological tool for our technopedagogical design with its Analysis, Design, Development, Implementation and Evaluation phases.Using Chi-square test, we examined the effect of the following independent variables: form of content, on trained type groups : hybrid and distanced at the threshold of $p < .05$. The results obtained show that trainee teachers have an increased need for their professional skills development through our FP@STAPS device using various digital resources. Thus, the evaluation of this device has shown its usefulness and effectiveness.The study therefore recommends the integration of this type of training into vocational training centers in Morocco. In addition, the study recommends that its technopedagogical design be based on referenced models such as ADDIE.

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1. Introduction

Nowadays,the Moroccan education system is faced with a large number of challenges, including adaptation and interaction with its socio-economic, technical and technological environment. Faced with this observation, the role of the teacher should evolve. in Western countries, the teacher is in the process of moving from a status of performer to a status of "professional".In this context, the training of teachers in Morocco since 2012 [1] through Regional Centers for Education and Training Professions (RCETP) adopted a one-year qualifying and professional training based on professionalization in teaching profession and on a competency-based entry method [2] promoting professional skills development linked to teaching.In addition, the advent and remarkable expansion of information and communication technologies (ICT) in various sectors of society: economic, political,social,cultural,educational and training sector [3-4-5-6-7-8] further promoted e-learning. Indeed, this type of learning is increasingly used as a powerful tool for learning and teaching process [9].E-learning offers useful features,such as easy access to learning materials and flexibility,as it allows learners to access learning materials both inside and outside classroom and provides personalized feedback [10].In this same perspective, this flexibility and availability of e-learning has been one of the biggest influences that have recently marked higher education (Kentor, 2015).On the other hand, we note in these recent years an explosion of ICTs and a variety of distance learning platforms such as MOOCs [11] and the appearance of mobile devices : smartphones, tablets and other mobile devices have become very efficient to allow learners who have not had the chance to enroll in one of the best universities in the world to take advantage of distance courses' content to learn and improve their knowledge [12].

In addition, in Morocco, the strategic vision 2015-2030 reform attaches paramount importance to ICTs' integration for development and promotion of digitally-based education and training through implementation of adapted, scalable, open and innovative systems.In addition, and with the aim of strengthening the integration of educational technologies to improve quality of learning and promote transition from a knowledge-consuming society to a society that produces and disseminates it, the Higher Council of Education, Training and Scientific Research (HCETSR) [13] recommends developing a national program, aimed at supplementing the equipment of schools with educational technologies, multimedia rooms and audiovisual equipment, and connecting them to internet network and equiping school libraries and university research structures with necessary digital resources, medium-term integration of ICT as a main subject in the initial and continuing training of all educational actors and the development and promotion of distance training as a complement to face-to-face courses. In this context, the professional training of future teachers of Physical and Sports Education (PES) at RCETP Casablanca-Settat, adhered to this vision by taking advantage of structuring characteristics,organization and adaptation offered by the Open Distance Learning (ODL) devices to offer them ODL on the model of SPOCs (Small Private Online Courses) for completing their initial face-to-face training and developing their professional teaching skills [14].

However, recourse to the use of this distance training device in vocational training requires a particular pedagogical, multimedia and organizational design [15].We rely in the technopedagogical design of our

FP@STAPS device on the ADDIE model. ADDIE model is used because it has systematic development stages, so that learning design is of better quality [16].This systematic process is represented in the teaching process, namely analysis, design, development, implementation and evaluation [17].

The objective of this study is to design an ODL system on the model of SPOCs (ODL-SPOCs) called FP@STAPS for reaching professional skills targeted by the training and meeting student-teachers' needs by understanding their priorities to improve technopedagogical design's courses offered for an effective e-learning.

In this context, our study would be guided by following question :

1) Are there statistically significant relationships of dependence between the needs expressed in terms of the ODL-SPOCs system's form and trainee teachers' group: hybrid or distanced?

2. Literature review
2.1. Integration of ICT in Morocco

The education and training system in Morocco, driven by the usefulness and opportunities offered by e-learning at the international level, has led several initiatives to integrate ICT into the education system: the initiation of MARWAN network in 1998, Injaz and Lawhaty programs [12] followed chronologically by National Charter of Education and Training, especially lever 10 in 1999 [18],Moroccan Virtual Campus in 2004 [19], Innovative Teachers Competition since 2005 [20],GENIE project (Generalization of ICT in Education, 2009-2013) in all universities and institutions of teaching [21].GENIE focused on equipment and development of educational content.It aims to develop the digital culture of all university stakeholders (teachers, administrative staff, students) and the integration of ICT in education, training, research and governance of higher education institutions [22], the Plan Maroc Numeric 2013 [23], the Plan Maroc Digital 2020 [24] and The Strategic Vision for the Reform of Moroccan School 2015-2030 (CSEFRS) [25].Similarly,various initiatives for integrating ICT into Moroccan university education have been taken by Moroccan universities such as the Hassan II University (UH2C) of Casablanca, Cadi Ayyad (UCA) of Marrakech, Mohammed 5 of Rabat, and Ibnou Zahr of Agadir (UIZ) in the form of MOOC (Massif Open Online Course).Nevertheless,Moroccan higher education system finds many obstacles and difficulties in the implementation of this new technopedagogical dimension, namely: transmission of knowledge from teachers to learners, always face-to-face, without pedagogical innovation and without exploitation of ICT,also the lack of teachers and students' motivation towards ICT and the lack of monitoring and periodic training of teachers on ICT and on new methodologies of university teaching [12].In addition, alongside these initiatives, there are constraints linked to change resistance in teaching practices which seem to emanate from the lack of extrinsic motivation and control over the educational use of ICT and those relating to infrastructure such as equipment, software and internet connection [26-27-28-29].Therefore, the aim of our study is to design a structured, organized and adapted ODL-SPOCs system for trainees' needs based on an effective instructional design.The following section will present a description of this design.

2.2. Instructional design

Instructional design (ID) is the systematic development of instructional specifications using learning and

instructional theory to ensure the quality of instruction.It is the whole process of analyzing learning needs and objectives for developing a delivery system to meet those needs.This includes the development of teaching materials and activities; testing and assessment of all teaching and learner activities [30].Instructional Design is a theory that serves as a guide in learning process and knowledge development [31]. For Baldwin and his colleagues [32],instructional design focuses on each student's performance, in accordance with teaching strategies and learning methods used.Smith and Ragan [33] highlighted three advantages for a systematic use of ID : it facilitates collaboration's teamwork such as coordination between designers, developers and those who will lead the teaching.It promotes 'congruence' between objectives, teaching and learning strategies and assessment methods so that what is taught and assessed is tailor-made, and it also provides a systematic framework for dealing with learning problems.Additionally, instructional design is very important when planning a learning intervention: it helps the designer or teacher creating effective, efficient and engaging learning experiences.Well-designed instruction is student-centered and results in better learning [34].Therefore, our study will focus on a learner-based instructional design while answering three questions suggested by [35]: Where are we going (teaching objectives)?,How will we get there (strategies and media)? and How will we know when we arrived 00 (evaluation strategies, program evaluation)? This ID is based on ADDIE model, one of several possible models that we will analyze in the next part.

2.3. Critical analysis of different models of instructional design

There are different models of instructional design that can be used to design a course.According to Liu (2014) [36], they can be applied in different learning environments, different types of learners, different means of application, different resource designs, among others.Indeed, we enumerate the ASSURE model of [37] which is a procedural, cyclical and classroom-oriented ID model for designing and developing technology-integrated instructions.It is an acronym that represents the six stages of the model: Analyze students ; Establish standards and objectives;Select strategies,technology,media and materials ;Use technology,media and materials ;Require students' participation ;Evaluate and review. Moreover,the model of [38] which consists of nine elements arranged in a circular manner in an oval shape form.The model's elements are: the identification of teaching program and specification of a course's objectives, the examination of learners' characteristics according to pedagogical decisions, the identification of subject's content with a tasks analysis linked to objectives and goals, specification of pedagogical objectives, pedagogical unit organized in the logical sequential order of learning, designing teaching strategies to achieve mastery of teaching objectives, planning and developing teaching, evaluating instruments to measure course objectives, and finally selecting resources for teaching and learning activities.In addition,the systemic approach model of [39] which is one of the most influential ID models.It looks like many other models because by involving fundamental elements of analysis, design, development, implementation and evaluation.Otherwise, [40] propose a blended learning curriculum design model.Their framework is divided into three stages: Pre-analysis, Design of activities and resources and Design of learning assessment. Hack, G.2016 [41] proposes a new model of blended learning's pedagogical design which is called a pyramid model with 4 levels : Level 1 includes: needs assessment, learners analysis, statement of objectives, resources analysis; level 2 includes: objectives development, blending and sequencing, design of learning activities;level 3 includes: developing evaluation strategies, providing and obtaining feedback; and level 4 includes: analysis and review.

The models below have been carefully designed based on the three learning theories (behaviorism, cognitivism, and constructivism), research and practice. However, we do note some similarities and differences observed regarding the general structure of each model with its purpose and objectives, the evaluation processes and the role of team collaboration. So even with these differences, these models constitute for designers a structured and organized benchmarks to frame their teaching practices for better learning conditions.

In this perspective, this study attempts to design an ODL system on the model of SPOCs based on the ADDIE model. It is one of the most commonly used in instructional design's field and it is represented in the educational process by the following stages: analysis, design, development, implementation and evaluation [17].In addition, the implementation of ADDIE model in teaching facilitates complex learning techniques [42]. In addition, the model has been adapted for online application in an online course design, following the steps of an instructional design template is important, although it does consume time to overcome any issues that may be encountered while teaching this course [43-44].

In this regard,we adopted in the present study ADDIE model not only because it was easily applicable, flexible and systematic, but also because it made it possible to return to previous phases [45].All its stages have been applied to our ODL-SPOCs technopedagogical conception from the analysis of trainee teachers' needs to their satisfaction's evaluation.

3. Methods

The instructional design model used in this study is ADDIE which covers five stages: analysis, design, development, implementation and evaluation.This model was chosen because it is a procedural model which is descriptive, showing clear and precise steps to generate our ODL-SPOCs device.

3.1. Sample

Our sample consists of 70 trainee teachers, including 19 female students in vocational training, all of them in vocational training at Regional Center of Educational and Training Professions Casablanca-Settat, during the period 2018/2019 of Physical and Sports Education (EPS) intended for teaching at middle and qualifying school level.It is divided into two groups :

- A group with hybrid training: formed by 44 trainee teachers (62.9%) that we called hybrid in reference to its ODL's form.They undergo a double initial training: face-to-face at the RCETP and online training through our ODL-SPOCs device called "FP@STAPS" which we hosted in a MOODLE Version 3.2 platform, a course management system used to create and distribute dynamic interactive online courses [46].
- A distanced training group formed by 26 trainee teachers from the 2017 training promotion who practice their profession and follow a face-to-face training at the RCETP spread over four weeks of reception,training and evaluation.

3.2. Measurement instruments

In the present study, we administered two questionnaires to two groups of our sample, which are closed or structured so that respondents choose the answer among various options according to their characteristics [47-48]. The first questionnaire describes an analysis of their needs in terms of developed professional skills and content's design proposed in our ODL-SPOCs system.The second concerns the evaluation of their satisfaction with the benefits derived of this online training.These questionnaires are composed of closed-ended dichotomous and multiple choice questions.

3.3. Data analysis

The data are analyzed by ANOVA I, Khi 2 (p <0.05) by comparing variables' frequencies, we examined the effect of the group on the following variable :

• Expected forms of training content with the significance level defined at p <0.05,

4. Results

4.1. Content's form needs

The results of Table 1 show that content's form preferred by trainee teachers towards our ODL-SPOCs device varies between text structured in titles, video sequences, images and sound recording.Indeed,64.3% of trainee teachers prefer the four modalities at the same time,with 42.9% for hybrid and 21.4% for distanced group.While 4.3% of trainee teachers declared their needs of content's training in the form of text structured in titles and subtitles,with 1.4% for hybrid and 2.9% for distanced group.Otherwise,no trainee teacher (0.0%) declared its need for sound recording supports.Nevertheless,ANOVA test's results did not show any dependency relationship between the typology of expected training form's content and trainee teachers' group (p> 0.05).

Table 1: Design parameters expected from ODL-SPOCs**.**

Expected forms of FP @ STAPS content	Training group						Chi-square test		
	Hybrid		Distanced		Total		Value	dll	p
	n	%	n	%	n	%			
Structured text in title and subtitle	1	1,4%	2	2,9%	3	4,3%	2.182	3	0.535
Video capsules	8	11,4%	4	5,7%	12	17,1%			
Images and course diagram	5	7,1%	5	7,1%	10	14,3%			
The four modalities at once	30	42,9%	15	21,4%	45	64,3%			
Sound recording	0	0,0%	0	0,0%	0	0,0%			

4.2. Design of the ODL-SPOCs device

In this step, we defined general objective of this training session which resides in the appropriation of a disciplinary knowledge relating to athletics and to develop in participants professional skills related to PES teaching through a professional practices' analysis.Thus, the teaching and learning strategies envisaged.The general objective of our distance training is announced on SPOCs' home page (Fig. 1).

4.2.1. Pedagogic objectives

The formulation of our pedagogic objectives is organized and classified based on Bloom's taxonomy (Krathwohl, 2002) [49].Our first training course entitled "Strengthening Basic Athletics Skills" is structured following three lower levels of Bloom's taxonomy which are: "Memorize, understand and apply".Its objective is to identify the basic concepts relating to athletics, namely: some definitions of experts in field, a classification of its different families and disciplines sports as well as a technical and regulatory analysis of some sports activities in athletics.The second course entitled "Professional skills to teach PES" is ranked according to three higher levels of Bloom's taxonomy,namely "Analyze, evaluate and create ".It aims to acquire trainee teachers basic professional skills related to teaching PES: planning, management and evaluation of learning through professional analysis of their teaching practices.

Figure 1: Screenshot of SPOC's home page.

4.2.2. Educational scripting of the FOAD-SPOCs device

In this part, we have organized our training content according to pre-established PES training program on one hand and on the other hand according to their needs.In addition,we have set up two training courses organized from the simplest to most complex following Bloom's taxonomy [49] and by establishing links between previous trainee teachers' learning and new professional skills expected.Each course contains theoretical course materials, discussion forums and formative tests to verify the achievement of our targeted objectives.

The overall pedagogic scenario of our ODL-SPOCs device is presented as follows:

- A first section called: "Before starting" reserved for a trainer and trainees'presentation (Figure 2).
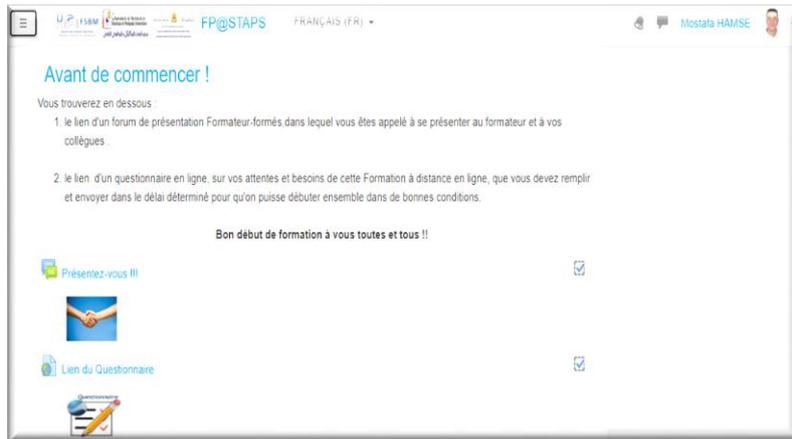
Figure 2 : Screenshot of the section: Before you begin!

- A second section which presents the first training course entitled "Reinforcement of basic athletic skills"
- A third section which presents the second training module entitled "Professional skills to teach PES".

Figure 3 shows a screenshot of our second training course.This course aims to develop professional skills relating to planning, management and evaluation of learning.It includes a theoretical part displayed in a form of video capsules, inserted word or pdf files where trainee teachers acquire disciplinary knowledge related to the theme taught, followed by a discussion forum and exchange of information on these basic professional skills, and ended with a formative test in the form of multiple choice questions to verify different trainees acquisitions. At the end of the course,trainee teachers are expected to submit their requested work in a form of word or audio files in a specific repository.
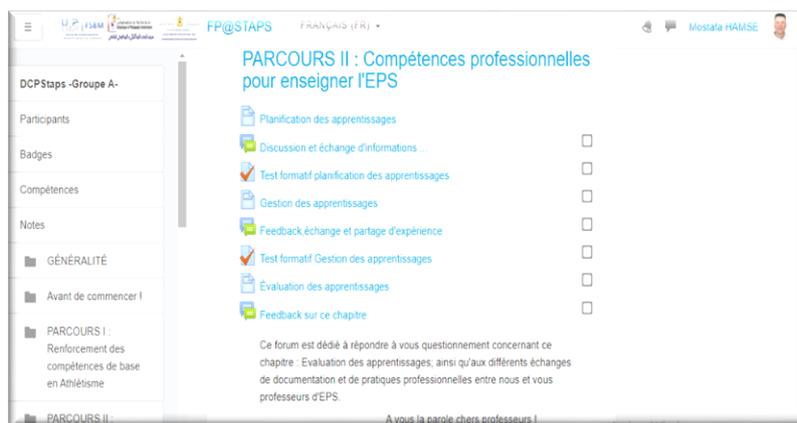
Figure 3 : Screenshot of second training course**.**

- A fourth and final section reserved for evaluating participants' satisfaction towards our ODL-SPOCs

system (Figure 4.).It contains a link to the questionnaire that participants must complete within the specified deadlines.

Figure 4: Screenshot of participants' satisfaction towards ODL-SPOCs device.

4.2.3. Teaching strategies

We have implemented teaching strategies to achieve this online distance training's objectives.Based on IMAIP model of [50] which is a pragmatic model of learning process organized in five essential facets: Inform, motivate, activate, interact and produce, we started the training with a presentation of trainer-trained where we got to know and informed trainee teachers about our ODL-SPOCs system.Thus,we identified trainees' needs and expectations towards the technopedagogical content of this training.Then, we set up two training courses containing supports in the form of text, video and audio capsules illustrating different course chapters.Moreover,we programed discussion forums to discuss and interact about course content and getting feedback from trainee teachers' experience in teaching of PES. These varied learning activities are completed by individual assignments and quizzes to verify targeted professional skills.
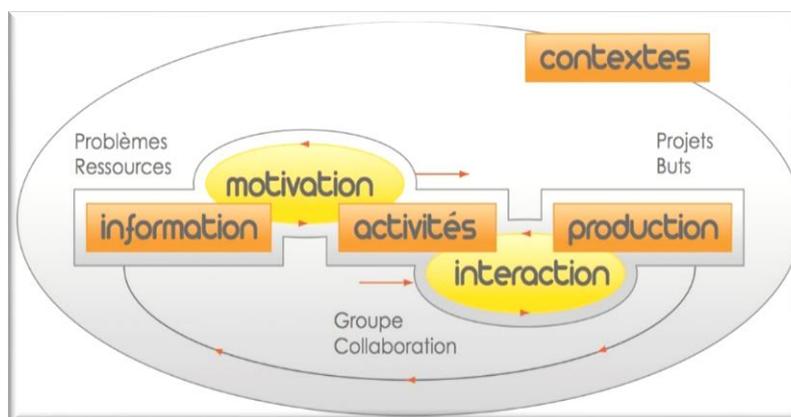

Figure 5: Facets to facilitate online learning (Lebrun 2007).

4.3. Development and implementation of the ODL-SPOCs device

This part is reserved for developing and validating learning resources and preparing learning environment and implementing the targeted learning solutions.

In our study, we chose to develop and host our course in a MOODLE platform version 3.2 (Figure 1), a course management system used to create and deliver interactive and dynamic online courses [46].This platform is characterized by several simple features which further promote communication and collaboration between trainer-tutor and the teacher-trainees.In addition,we used as multimedia tools inserted word and pdf files as theoretical support for courses,links hypertext links,video capsules,sound recordings for responding to different trainees' learning styles,also online qcms,homework deposit areas and discussion forums and sharing of information and experiences by being part of a socio-constructivist learning approach.

The implementation and management of learning activities took a training courses' form (Figure 3) which begin with a theoretical background, then a discussion forum on this contribution by answering various questions raised by trainee teachers and prompting collaborative learning and finally ended with a test in the form of a multiple choice test to check the achievement's degree of targeted professional skills.Each part of this course is delimited by a specific time slot.We used "What's up" application by creating a class-group to inform and remind trainee teachers about various activities offered and their deadlines.

5. Discussion

The aim of our study is to design an ODL-SPOC system in order to reinforce and develop professional skills related to teaching PES.Our technopedagogical design is based on ADDIE model.Indeed,the interest of our study is to evaluate this distance training by comparing needs and academic performances of two groups of trainee teachers participating in this online distance training: hybrid and distanced.The discussion of the results obtained would revolve around the following axes:

- Design of the ODL-SPOCs device

In this part, we have designed this distance training in a structured, organized and adapted way to participants' needs so that it is useful and pleasant to follow.In this perspective, according to [51],the quality of design could make learning experience both boring or entertaining and meaningful or meaningless.For our targeted pedagogical objectives,based oon Bloom's taxonomy, we organized a first training course for achieving basic elementary skills relating to athletics.This strategy is supported by [52] which states that for new acquired skills,basics must be learned first.Content sequencing is therefore an important factor in helping students to develop new skills.Then, we set up a second training course whose objective is to develop professional skills related to teaching: planning, management and evaluation of learning through theoretical course materials but above all by relying on an exchange and sharing professional experiences in discussion forums.Our conception of these forums is justified by our concern to aim higher levels in reference to Bloom's taxonomy on one hand and on the other hand to create conditions of sharing and interactivity between trainee teachers and tutor's trainer.These pedagogical choices are in line with several previous research which has shown that online

learning can be as effective as face-to-face lessons, but only if learners benefit from well-designed interaction activities [53-54-55].In addition, the studies of [56] and [57] encourage learners' active participation by providing more opportunities for interaction which is an effective approach to promoting online courses' success. Nevertheless, these interaction opportunities must be frequent and massive to create favorable conditions for learning.Moreover, in previous studies by [58-59], the amount of Interaction was considered to be an important factor predicting learning outcomes.Goggins and Xing (2016) [59] examined asynchronous interaction activities of learners in a discussion forum as part of an online graduate course.The amount of learner participation in discussion (which was measured by the number of messages written and read) was significantly correlated with success. For the ODL-SPOCs pedagogical scripting,we have set up two main training courses which meet on institutional training requirements of future PES teachers and on participants' needs. Furthermore,we are focused in our scripting on discussion forums and experience sharing since the goal was to analyze trainee teachers' professional practices to develop in them critical and reflective thinking likely to further develop their professional skills relating to teaching.For our teaching strategies adopted in this ODL-SPOCs,we were based on a pragmatic and active learning model: Inform, motivate, activate, interact and produce which operationalizes a new pedagogy putting trainee teacher as the training center.Moreover,we have adopted an interactive and permessive teaching style that offers trainees the opportunity to verbalize their difficulties encountered in their professional practices in a climate of exchange and sharing.

This good climate is further reinforced by a clear and effective educational message.In this vein, [60] states that an effective educational message can help to motivate communication when it is designed in the context and according to learners' needs .In order to understand the task,learners must met their needs and level of understanding.

- Development and implementation of the ODL-SPOCs device
  In this part, we have chosen to host our distance training session in MOODLE platform version 3.2 because of its several interactive and easy-to-use features for trainee teachers and also it allows a quantitative follow-up of trainees by trainer-tutor.Our choice is supported by results of several previous studies.Indeed, [61] cite some factors favoring the use of the MOODLE platform: accessibility of the system, self-efficacy and student satisfaction.In addition, for [62] other factors contribute more to the adoption of this platform,namely familiarity and experience with technology ; better organization of content and an engaging, powerful and flexible learning experience.In parallel, the implementation of multimedia tools in a form of structured text files, audio or video capsules comes to meet different trainee teachers' needs and especially their different learning styles.This technopedagogical choice is supported by studies' conclusions of [63] and [64] affirming the existence of an interaction between learning supports and learning styles on learning outcomes learning. Soylu and his colleagues [65] and Fan and his colleagues [66] in their research also conclude that there is an interaction between learning materials and learning styles on learning outcomes.The results of this research support those of [67] and [68] who conclude that there is an interaction between learning materials and learning styles by influencing the ability to understand learning materials that has an impact on students achievement.

6. Conclusion

The present study aimed to design an ODL-SPOCs system to help future PES teachers to develop their professional teaching skills.The technopedagogical design was based on ADDIE model,one of the famous instructional design models.In the needs analysis's phase, ,two-thirds of participants expressed a need for a varied form of content :structured text in titles,video clips, images and sound recording.In the technopedagogical design and implementation phases of our ODL-SPOCs device,we hosted this distance training in an easy-to-use MOODLE platform version 3.2.

Thus,we programmed two training courses with structured and adapted pedagogical objectives according to Bloom's taxonomy and directly related to the professional training of trainee teachers.These courses contained discussion and sharing forums to further promote trainer-trainee interaction and feedback.

Our study has some limitations,namely the small experimental sample of trainee teachers,as well as the limited duration of our training calling into question obtained results' generalization in other RCETP in Morocco.Future research could focus on a larger sample and at other professional training centers in the kingdom to compare and draw new conclusions.At the same time,the study could also be extended by a survey for policymakers to determine barriers to integrating distance learning into professional training of future teachers in Morocco.

7. Recommendations

As the trainer and designer-tutor of this online distance training, we recommend :

- The application of instructional design model such as ADDIE that can make the training rational, efficient and effective.
- We also recommend that managers of professional training institutions integrate and set up this type of training in the initial training course in a form of hybrid training based on ADDIE model in order to supplement the initial professional training of future PES teachers on one hand,and on the other hand to contribute to professional training's digitalization that Moroccan education system has always aimed for in recent decades.

Acknowledgements

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