European Journal of Curriculum Studies, 2016
Vol. 3, No. 1, 407-417

Reasserting curriculum design through virtual learning environments: The case of MAPE

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Abstract
MAPE is a curricular model for virtual learning at the University of the Azores, Portugal. After being used for teaching Curriculum Theory and Development through e-learning and b-learning, this model has been, in the academic year 2014/15, extended to other courses. Besides describing the model and explaining its evolution, this paper reports a study of its implementation, for the first time, by more than one instructor. Accordingly, the main objective of the study is to test the MAPE model on a multi-course level. In this specific case, the model has been implemented in eight courses from the specialization program in e-learning. A more theoretical objective is also pursued: to explore the development of a curricular model for virtual learning environments as an opportunity to discuss the role of curriculum design in contemporary Curriculum Studies. Assuming that curriculum design can be defined as the arrangement of the elements of a curriculum, including educational materials, and that virtual learning environments are especially rich in resources that can be arranged in multiple ways, it is important to discuss the creative potential of this relationship between curriculum design and e-learning.
The methodology that has been used to study the development of MAPE is design research, which aims at providing design principles for making a product, assuming that such approach is applicable to different kinds of products, including artifacts, activities, services, policies, environments, educational materials, virtual learning environments, and curricula. More specifically, the study of MAPE can be considered an instance of the application of design research to e-learning, inasmuch as it aims at generating guidelines for developing virtual learning environments. It can also be can be viewed as an instance of curriculum design research – a variation of educational design research whereby one studies the design of either a curriculum or a particular aspect of a curriculum. Design research is usually based on the construction and evaluation of a succession of prototypes of the product, which, besides aiming at its improvement, is expected to generate design principles that can be adopted in a wide range of contexts. Prototypes 1 and 2 of MAPE had been evaluated at a very small scale. In 2014/15, through the adoption of Prototype 3 in several courses from a specialization program, MAPE is being used, for the first time, by instructors who did not participate in the first stages of its design. This paper is focused on the evaluation of the model in this wider context. The main evaluation tool being used at this stage is a student questionnaire.
Considering that this paper is being submitted before the end of the second semester, it presents results from the first semester only. Such results reveal a very high level of student satisfaction with the model in terms of its practicality and effectiveness. Considering that the results of the previous moment of evaluation had not been so satisfactory, the paper discusses possible reasons for such differences in student satisfaction and their implications in terms of the consolidation of design principles.

Keywords: Curriculum design; Virtual learning environments; MAPE; *Moodle* platform.

Introduction

The impressive growth of e-learning at a global scale is a challenge for Curriculum Studies, inasmuch as designing curricula for learners who might be far away from their teachers requires special kinds of answers to the fundamental questions around which Curriculum Studies are structured. Answering the core question – What to teach? – is a quite complex endeavor when no more than face-to-face instruction is considered. Answering the same question in contexts of distance learning through electronic media is even more complex. Limitations imposed by distance imply that the question "What to teach?" is accompanied by the questions "What can be taught online?" and "What can only be taught via face-to-face instruction?". In addition, "How to teach?" – another frequent question in Curriculum Studies – is necessarily answered with a specially strong focus on technological issues when curriculum is supposed to be delivered to distant learners. The possibilities and the limitations of technology as a means for supporting distance learning have to be taken into consideration when decisions on specific elements of the curriculum – for example, decisions on educational objectives and assessment criteria – are made by designers of curricula for e-learning.

In order for students to learn what they are expected to learn, communication is required. The differences between face-to-face communication and communication mediated by technology have significant implications for curriculum and instruction. If communication is synchronous, it is still difficult to ensure the participation of a large number of students in a lesson taught via e-elearning, despite technological improvements, which conditions the amount of topics that can be addressed at a given time and the instructional strategies that can be used. If communication is asynchronous, the accessibility of curriculum for students depends, to a large extent, on the usability of the learning environments. Therefore, a strong emphasis on the latter is required when curriculum is planned.

The challenge of designing curriculum models for e-learning is being faced at the University of the Azores (UAz). On the one hand, distance education through electronic media is still at a very early stage of development in that institution. On the other hand, the fact that UAz is located in an archipelago and has three campuses has frequently been mentioned by members of its governing bodies as important reasons why the institution should develop elearning. This orientation has also been suggested by the National Agency for the Accreditation of Higher Education. For example, in the final evaluation report on the Master's program in Management and Conservation of Nature, the evaluation team states that it is strange that distance learning is not more developed at a University located in an archipelago with nine islands (A3ES, 2014a). Another example can be found in the final evaluation report on the Bachelor's program in Sociology. In this case, one of the improvements suggested by the evaluation team is the development of "systems of communication between islands through distance learning in order to improve interaction between instructors and students who may eventually live in other islands" (A3ES, 2014b, p. 3).

Considering these challenges, some attempts to design institutional strategies for e-learning have been made at UAz. The Strategic Plan for the

Development of the institution in the period 2012-2015 mentions distance learning as an opportunity (UAc, 2011, p. 44). In 2012 an Office for Virtual Studies was created at UAz, with the mission of supporting the development of e-learning. In 2015 the Rector of UAz appointed a team of faculty members to study the steps that had already been taken in the development of distance learning at UAz, as well as possibilities in terms of further steps, to be taken in the near future.

At the moment when the present text is being written, the situation of UAz in terms of e-learning can still be characterized as a set of experiences, rather than a structured project. The study of those emerging experiences may contribute to the production of knowledge that can be useful for supporting decisions aimed at the construction of a more structured and consolidated approach.

One of the initiatives taken within UAz in the field of e-learning has been the development of MAPE – a model for online learning. After being used for teaching Curriculum Theory and Development through e-learning and b- learning, this model was, in the academic year 2014/15, extended to other courses. The main objective of the study reported on this text is to test MAPE on a multi-course level. A more theoretical objective is also pursued: to explore the development of a curricular model for virtual learning environments as an opportunity to discuss the role of curriculum design in Contemporary Curriculum Studies.

The emergence of MAPE

MAPE started to emerge in the academic year 2011/12, when, for the first time at the UAz, a course on Curriculum Theory and Development was delivered online to students of the Bachelor's program in Basic Education. As the course was taught, an emerging model for online learning – named CTD-O (Curriculum Theory and Development Online) – was experimented. In the following year the same course was, once again, taught totally online, which allowed for a new stage in the development of CTD-O. In the academic year 2013/14, CTD-O was used for teaching one third of a course from the same field in the Master's program in History and Geography Education. In 2014/15, the model was, for the first time, adopted in several courses, taught by different instructors, at UAz. In the first semester, one third of a course on Organization of Educational Systems, taught to students of the Bachelor's program in Basic Education, was based on CTD-O model. In addition, the model was adopted in eight courses from the specialization program in e-learning, which functioned for the first time in 2014/15. Since those courses are related to different fields (no longer Curriculum Theory and Development only), the name of the model was changed into MAPE, which is an acronym for Modular, Asynchronous, Participative, and Emergent. These characteristics of the model will be explained later on.

The development of MAPE has been studied via curriculum design research, which can be considered a variation of educational design research whereby the development of a curriculum or a specific aspect of a curriculum is developed (van den Akker, 2010). This kind of methodology is frequently used for studying the development of new virtual learning environments (Herrington,

Reeves & Oliver, 2010). Both in educational design research in general and, specifically, in curriculum design research, studying the development of an educational resource usually implies constructing and evaluating a succession of prototypes. This kind of approach is intended not only to allow for increasingly sophisticated versions of the product but also to facilitate the emergence of design principles that can be adopted in a wide range of contexts, beyond the specific context wherein the study has been conducted. It is expected that such statement of principles contributes to the construction of knowledge on the characteristics of the educational interventions that have been undertaken, and also knowledge on "the process of designing and developing them" (Plomp, 2010, p. 13). In other words, the development of solutions to practical problems is connected to empirical research, aimed at theoretical understanding (McKenney & Reeves, 2012). This approach is clearly interventionist, inasmuch as "the research aims at designing an intervention in a real world setting" (Plomp, 2010, p. 15), especially when clear guidelines or heuristics are not available in order to address problems that occur in that same setting. The development of virtual learning environments in a higher education institution with special characteristics (three campuses, located on a small and remote archipelago) is an example of such kind of problem.

Although guiding principles for the virtualization of courses in higher education are available from the literature, the case of UAz is so specific that it requires specific solutions. A simple application of general guidelines would certainly be counterproductive. Sustainable solutions should be built on the few initiatives that have already been taken at the local level.

The development of MAPE – which is technologically based on the *moodle* platform – is the most enduring elearning experience that has been implemented at UAz. Throughout the successive stages of such development, which has included empirical research, MAPE has kept the four characteristics that justify the acronym: it is Modular, Asynchronous, Participative and Emergent.

MAPE is **Emergent** because it is still at an early stage of development, which is not based on the application or adaptation of another model. Instead, it is based on an effort to address practical problems through reflection on theoretical issues and on outcomes from more advanced experiences, which have taken place in other contexts. It has been constructed with scientific humbleness and caution. For the time being, expectations related to the adoption of knowledge – especially in the form of curriculum design principles – generated by these studies are limited to the local context.

Its specific characteristics notwithstanding, MAPE is influenced by consolidated models, which have been consistently tested, generalized and diffused – especially socio-constructivist models of e-learning (Moreira, 2012; Willis, 2009). In the context of such influences, it can be considered **Participative**, for it is based on the assumption that the participants assign meaning to the educational material when they become engaged in high levels of interaction (Salmon, 2013). Another reason why it may be considered participative is the fact that its continuous improvement is, to a large extent, based on the outcomes of its evaluation by different actors: students, instructors, and external evaluators.

Models of e-learning based on asynchronous communication allow for a radical approach to instruction – one that frees teachers and students from the constraints related to space and time that shape traditional teaching. MAPE has been designed as an **Asynchronous** model in order to take advantage of the potential for innovation brought about by such radical approach.

Asynchronous approaches usually do not eliminate segmentation of the time assigned for instruction. Accordingly, MAPE is **Modular**, because the courses or parts of courses wherein it is adopted follow the typical approach of asynchronous models in terms of time segmentation, that is, instruction is carried out through a succession of modules. Each module is focused on specific educational objectives and may last one, two or three weeks. Shorter modules would not provide enough time for asynchronous communication to flow effectively; longer modules would probably increase temptation to procrastinate, which is one of the main risks of asynchronous communication via electronic media (Graham, 2005).

The general organization of the course across the semester – which is a modular one in the case of MAPE – is just one of the aspects that should be taken into consideration in the construction or in the analysis of a virtualized course. It is also important to consider the internal organization of the modules, as well as the kinds of tasks that they require from students. Therefore, figure 1 illustrates three levels of analysis.

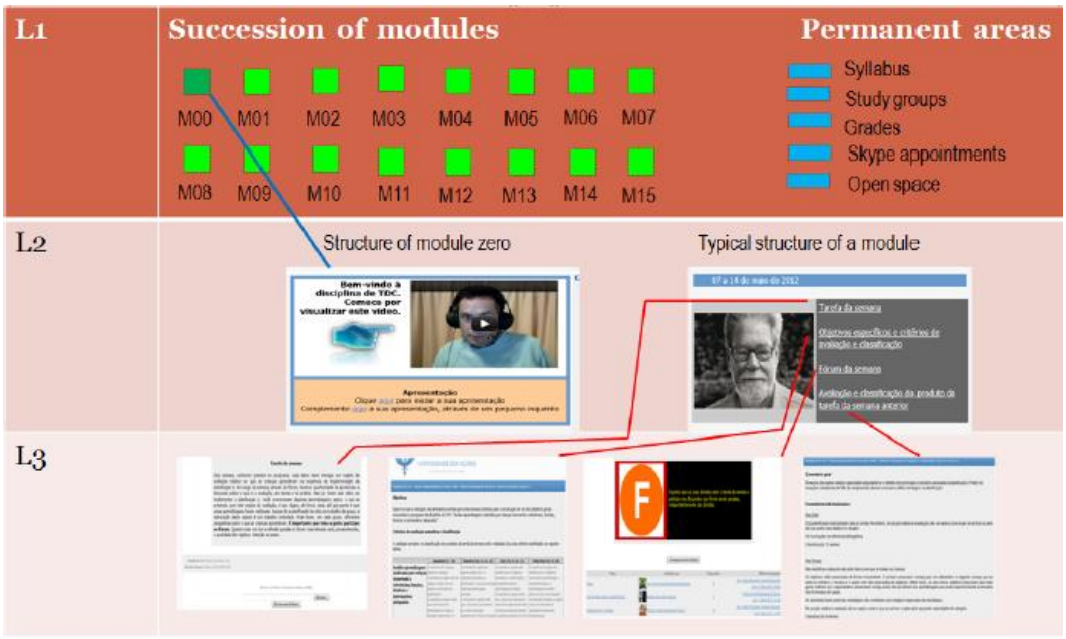

Figure 1: A framework for the analysis of MAPE

On the first level, the modular nature of MAPE is portrayed. The content of each module is revealed to the students only when the module starts, for revealing all the material at the outset would imply an unnecessary overload of information. However, some elements of the learning environment are visible to the students throughout the whole semester – for instance, the course syllabus and the grades, which are updated at the end of each module.

The second level represents the structure of a module, which is shown in more detail by figure 2. In that structure, which is visible on the interface as soon as the student accesses the course on the electronic platform, the most important elements are the four components around which all the modules function: guidelines for the module's tasks, expected learning outcomes for the module and related assessment criteria, the module's forum, and evaluation of the previous module.

Figure 2: Typical structure of a module

In order to obtain information or to interact with the instructor and with classmates in the context of each of those components, the student accesses, via hyperlinks, specific pages, which, as figure 2 illustrates, are considered at the third level of analysis. This is the level at which teaching and learning are managed more directly.

The guidelines for the learning tasks that the students are expected to accomplish, with the instructor's support, in each module can be provided via text, audio, or video. Combinations of those three kinds of channel are frequent, considering that media integration can impact the quality of communication and students' learning experience (Kim, Kwon & Cho, 2011).

Since the purpose of the tasks is not always obvious, it is expected that the explicit statement of the expected learning outcomes and related assessment criteria raises the students' awareness of the reasons why each task is assigned. The educational objectives and the criteria for assessing their achievement are always revisited in the following module, in the context of the section "Evaluation of the previous module", which strengthens connections between modules and enhances formative assessment (Sousa, 2014a).

The forum may serve different purposes. It frequently functions as a tool whereby the instructor supports the students, by answering their questions, correcting their mistakes and encouraging co-presence, that is the experience of

participating in a virtual learning environment with someone else (Stevens-Long & Crowell, 2010).

Student participation in the forum may or may not be considered as an assessment device. In either case it is one of the main ways of ensuring the participative nature of MAPE.

The evaluation of MAPE

The evaluation of MAPE has encompassed the three dimensions of an educational product (a virtual learning environment in this specific case) that are usually considered by educational design research – validity, practicality, and effectiveness (Nieveen, 2010). Furthermore, it has applied a wide range of evaluation techniques that are frequently used in this kind of research, including screening, tryout, and expert appraisal.

Three prototypes of MAPE (including those that were designated as CTD-O) have already been evaluated: P1 (2011/12), P2 (2012/13) and P3 (2013/15). The latter was implemented in three specific contexts:

(1) In 2013/14, for teaching one third of a course on Curriculum Development, in the Master's program in History and Geography Education;
(2) In 2014/15, for teaching one third of a course on Organization of Educational Systems, in the Bachelor's program in Basic Education;
(3) In 2014/15, for teaching eight courses from the specialization program in e-learning.

Considering that outcomes from the evaluation of P1 and P2, as well as from the implementation of P3 in the first two contexts, have already been published (Sousa, 2013, 2014a, 2014b, 2015), the specific study reported in this text is focused on outcomes from the implementation of P3 in the third context – a context wherein MAPE was used, for the first time, by instructors who did not participate in the first stages of its design. More specifically, the implementation of MAPE in four courses from the specialization program in e-learning is addressed, considering that the second semester had not finished when the proposal for this paper was submitted.

Evaluation of P1 and P2 yielded very good outcomes. The same happened with regard to the first implementation of P3. Through their answers to online questionnaires, the students expressed positive opinions about their easiness of navigation within the learning environment, that is, about MAPE's practicality or usability, and also about its effectiveness in allowing for acquisition of relevant knowledge. In that stage, there was only one student who stated that if the course had been delivered via face-to-face instruction she would have learned more than she did by taking the course online. Moreover, there was only one student who stated that if he could go back in time and decide he would have taken the course via face-to-face instruction. The other respondents stated that they would have taken it online. Approximately one third of the students stated that they had learned roughly the same online as they would have learned if the course had been delivered via face-to-face instruction, another third stated that

they had learned more, and still another third stated that they had learned much more (Sousa, 2013, 2014a, 2014b).

The outcomes of the second implementation of P3 were not so good. A detailed presentation and discussion of those outcomes was made in another publication (Sousa, 2015).

Improvements in P2, fueled by the evaluation of P1, were mostly focused on technical issues. In other words, they were aimed at the enhancement of construction validity. The evaluation of this aspect of MAPE at that stage was conducted mainly through expert appraisal, whereby a Professor of Educational Technology wrote evaluation reports on P1 and P2. Recommendations conveyed by the report on P1 guided changes in technical aspects of P2, especially with regard to the production of podcasts.

Technical changes were also predominant in the transition from P2 to P3. In that period, the modules were numbered and a field for a very brief summary of the content was added to the design of the modules' structure. Finding information within the learning environment became easier after these changes.

The above-mentioned changes facilitated the management of communication in light of a spiral view of the curriculum. This idea, which is inspired by the work of Bruner (1960), implies that the learning environment is organized in such a way that certain topics are addressed more than once, at different moments, with increasing complexity. Ensuring that the students become aware of connections between topics is also crucial in this approach. The virtualization of learning environments is compatible with a spiral view of the curriculum, inasmuch as it facilitates automatic recording, logical organization and provision of all the study material.

In the construction of P3, following the evaluation of P2, there were also improvements in the layout of the web pages that are considered at the third level of analysis. The earliest versions of those pages were designed by using basic tools provided by the electronic platform. Now their design is more attractive, because of a more sophisticated edition of text, color, image, audio, video, and other resources.

Studying MAPE at a multi-course level

In the first semester of the academic year 2014/15, MAPE was implemented, for the first time, by more than one instructor. This extension occurred in the context of a specialization program in e-learning. This program, which lasts two semesters and includes ten courses – five in each semester –, is open to any person who has at least a bachelor degree and wishes to improve his or her ability to teach online.

The first semester includes the following courses: Educational design for e-learning; Models of e-learning; Technological resources for e-learning; Contexts, needs, and opportunities for e-learning; and Communication through media. In 2014/15, the virtual learning environments wherein all of these courses except the latter functioned were designed according to the MAPE model.

Twelve students were enrolled in the program in 2014/15, but, unfortunately, only five of them finished it and only three answered an evaluation questionnaire at the end of the first semester, which was intended to obtain data related to their perspectives on MAPE. Despite the extremely small number of

participants, some data generated by that questionnaire is rich enough to be considered in a context wherein one wishes to study the model in order to improve it.

Through their answers to closed-ended questions, the respondents disclosed their opinions on how the model is structured and functions. All of them considered the structure of MAPE "extremely adequate" and navigation within the virtual learning environment "very easy, based on an excellent organization" of that same environment. Two students stated that the instructors' commitment to formative assessment was "more than enough" and one student stated that it was excellent, for the instructors "explained what was wrong and provided suggestions for improvement".

Through their answers to open-ended questions, they expressed their opinions on both the most positive and the most negative aspects of the model. The following transcripts provide relevant data.

> "In general, the most positive aspects were: (1) the high level of interaction between instructors and students, as well as between classmates; (2) the constant feedback provided by the instructors. (…)
> The most negative aspect was the fact that we once had to submit assignments related to several courses on the same weekend. (…)"
> (Student A)

> "The organization of the learning environment (…) was very schematic and intuitive, even for people who do not know much about ICT. (…)"
> (Student B)

> "In addition, the students provided suggestions for improvement.
> More time should be provided for accomplishing the tasks within some of the modules."
> (Student A)

> "My adaptation to the model was perfect. Therefore, I do not have suggestions for its improvement. In my opinion, the model should be implemented in all the courses next semester."
> (Student B)

This data suggests a high level of student satisfaction with regard to MAPE. A high level of satisfaction had also been reported for P1, P2 and for the first implementation of P3 (Sousa, 2013, 2014a, 2014b). The outcomes of the second implementation of P3 were not so good (Sousa, 2015). However, that implementation of P3 was carried out under especially difficult circumstances: an unusually big class for the context, that is, 50 students taking a course provided at the first semester of a bachelor's program in basic education. These facts suggest that the lower level of student satisfaction that was reported in this specific case might have been an exception. Thus, there is some potential in MAPE for the consolidation of emerging design principles.

The transcripts also suggest that more attention should be paid to time management in the implementation of the model. Accordingly, in the second semester all the instructors agreed on organizing the modules of all the courses in such a way that no more than two modules (from different courses within the specialization program in elearning) would finish at the same time.

Conclusion

MAPE has progressed from a situation wherein it was implemented at an extremely small scale to a situation of implementation in a wider context, within UAz. Throughout that process, the evaluation of successive prototypes – under the framework of curriculum design research – has allowed for the improvement of technical details, and also for the consolidation of principles for curriculum design. The statement of such principles has become increasingly based on both empirical evidence and theoretical assumptions.

One of those principles consists of maximizing the potential of communication that flows within a virtual learning environment in terms of its transformation into study material whose quality can be easily controlled. Unlike notes taken by students in classrooms – which sometimes distort the message that the instructor intended to convey –, messages that are exchanged online are, in most cases, automatically recorded. Usually instructors are able to access those messages easily and control their quality, in order to avoid distortions.

Such automatic recording of the student's progress, which is not frequent in face-to-face instruction, facilitates the development of constructivist strategies, including scaffolding and coaching (Bellefeuille, Martin & Buck, 2009).

The transformation of electronic communication into study material can be related to a more general principle – the spiral organization of the curriculum. This kind of organization, which has been widely explored in the context of face-to-face instruction, can also be explored in the context of online learning, by taking advantage of the abovementioned tools that allow for easy recording and organization of the study material. The adoption of this principle in the context of MAPE has been intertwined with a strong commitment to formative assessment.

These emergent principles confirm that virtual learning environments are rich in resources that can be arranged in multiple ways. Since some of those resources are strongly representative of the curricula being enacted, virtual learning environments seem to have potential for the reassertion of curriculum design within Curriculum Studies.

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Received: 14 January 2016

Accepted: 25 March 2016