Supporting the Generation of Guidelines for Online Courses

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The research on online teaching is a demanding field that requires an innovative point of view to support courses in this context. There are multiples approaches to design, implement or deliver online courses. Nevertheless, less attention has been paid to assist teachers in order to guide them to use technology-based environments in this kind of courses. This work proposes an approach to support the generation of teaching guidelines based on a conceptual framework that enables the representation and processing of the instructional and technological issues involved in an online course. The application of this approach will allow the instructor to define the instructional requirements of a specific learning setting and to map them with the features provided by a Virtual Learning Environment. This mapping process should facilitate the systematic generation of teaching guidelines based on matching both instructional and technological concepts.

1 Introduction

The research on online teaching is a demanding field that requires an innovative point of view to support courses in this context. There are multiple approaches based on developing instructional strategies, specifying content formats or deploying technology-based environments which are addressed to design, implement or deliver online courses.

Nevertheless, the support to guide instructors when they are using such strategies, formats or environments is a topic which has been paid less attention. Moreover, instructors need to know how they should tackle a specific online course in which multiple kinds of educational technologies can be used. The scope of the current work is mainly focused on the support to instructors when using Virtual Learning Environments (VLE). This kind of platforms usually provide different tools to store and organize course content items, to elaborate and deliver assignments, to provide communication facilities or to assess and grade students' performance during the course. Instructors are generally trained to handle or manage such tools but little help is offered to guide them in the development and delivery of online courses supported by these tools.

The current work presents an approach to assist instructors in the generation of guidelines to help them to take advantage of the features offered by VLE platforms in their online courses. This approach is based on a framework called TAGGE (Teacher Assistance Guideline Generation Engine) which enables the representation and processing of the instructional and technological issues involved in an online course. Concept maps have been used to represent such information in a notation which is well-known by instructors and it can also be processed by means of computer applications. Therefore, instructors can configure the main concepts and relationships about their course requirements and then, link such information items to the maps representing the VLE features. This process should facilitate the systematic generation of teaching guidelines based on matching the concepts which are part of the instructional requirements and those which can be provided by the VLE tools.

The rest of the paper is organized as follows. Section II presents some works related to the proposed approach. Section III describes the main features of the overall approach. Section IV introduces an example of approach application to a specific learning context. Section V illustrates the discussion of the presented approach, and, finally, Section VI gives some concluding remarks.

2 Related works

The development and delivery of online courses have been supported by a high number of initiatives and projects. These initiatives have been focused

on technological aspects about formats, tools and environments used in these courses. However, less attention has been paid to assist teachers in order to prepare them for using such technologies. UNESCO (2002) considered the relevance of open and distance learning so that this organization proposed recommendations concerning teacher education in this context. Some teacher associations such as the American Federation of Teachers (AFT, 2009) or the National Education Association (NEA, 2009) have developed guides addressed to teach online courses. These guidelines define "effective online education environments" skills for online teachers though they are rather generic and only provide examples of abstract abilities.

In a more specific scope, some institutions such as the Illinois Online Network (ION, 2009) or the University of Michigan (CRLT, 2009) provide teaching models and instructional strategies to design courses in online environments. The Macquarie University (LTC, 2008) defines a checklist of guiding principles classified in several categories such as "Curriculum design with technologies" or "Learning resource design and development" and the Finley university proposes a "guide while designing and reviewing Blackboard distance learning courses" (ACT, 2004). Oliver (2000) describes principles and strategies to support the teacher work on Web environments and Zhu, Dezure, & Payette (2003) propose guidelines for effective instructional practices in online courses supported by VLE platforms. Most of the reviewed proposals are focused on providing guidelines based on text reports or checklist forms.

Therefore, a more systematic approach is necessary to assist teachers in the generation of guidelines to help them to take advantage of the VLE features. The JISC initiative (JISC, 2009) proposes a "Planning Sustainable Course Design" for instructors to optimise the potential of Virtual Learning Environments. Cloudworks addresses a flexible model for LMS course design based on ICTELT Framework (Owen, 2008) because "often staff will be at a loss as to what they really want to include in a Learning Management System course". LearningMapR (Buzza *et al.*, 2005) provides a "course framework familiar to instructors" based on the IMS LD standard specification. This specification provides a model for designing units of learning which can be used for implementing online courses in some VLE contexts. The current work is also oriented towards the modelling of instructional issues in online courses but addressed to support different kinds of VLE platforms.

3 Approach description

The proposed approach aims at supporting the generation of teaching guidelines for online courses which are developed and delivered by means of VLE platforms. This support process is based on modelling the knowledge items

about the instructional and technology issues that are part of these courses. Usually, text formats have been used to represent this kind of knowledge and the resulting guidelines, as aforementioned, have been bounded to general instructor recommendations or informal strategies. Nowadays, there are different notations such as ontology formats (Amorim *et al.*, 2006), educational modelling languages (Buendía & Díaz, 2003) or standard specifications (Buzza *et al.*, 2005) which permit to represent and process these knowledge items in a systematic way. In the current work, concept maps (Novak, 1998) have been selected because they are able to represent multiple types of information as well as providing a structured format which can be processed by means of computer applications. The semantic model is rather simple because it is composed by two main components: concepts that represent notions or ideas about a knowledge domain and relationships which link such concepts. Moreover, concept maps can be represented in a graphical view by means of circles or boxes to represent concepts as well as connecting lines for relationships.

This conceptualizing schema is the basis for the TAGGE (Teacher Assistance Guideline Generation Engine) framework as the main mechanism to support the generation of teaching guidelines in systematic and flexible way. Figure 1 shows a simple diagram of the TAGGE framework that holds up the proposed approach. TAGGE takes as inputs the learning requirements attached to a specific online course and it processes them to enable the generation of guidelines to assist instructors in their particular learning settings. This processing is based on connecting the concept maps representing the instructional and technological issues which are part of an online course. On the one hand, there is a concept map (left box in Figure 1) that models instructional issues such as learning goals or topic contents of a course and, on the other hand, there is another concept map (right box in Figure 1) representing technological aspects of a VLE platform such as a Calendar service or a Resource repository. Then, the Domain Mapping process (centred area in Figure 1) is addressed to match those concepts which describe how a given VLE-based feature can contribute to support a specific instructional component of an online course.

The framework inputs can be classified in several categories such as:
- General learning needs which set up the course goals at a high level of abstraction (e.g. an academic context vs. an enterprise setting).
- Learner profile which defines the main student characteristics (e.g. level, age, previous knowledge…).
- Subject features that describe the discipline or domain of the course (e.g. a more theoretical subject vs. a practical discipline).
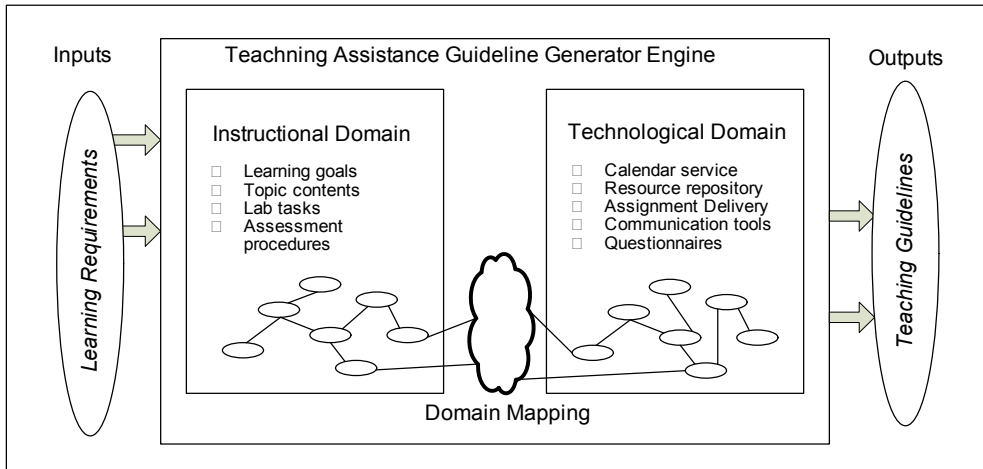
Fig. 1 - TAGGE framework overview

These inputs are used to select the instructional issues which are part of the online course model represented by the concept map located at the left box in Figure 1. Such instructional issues define those learning objectives, course resources, learning tasks, or assessment activities which configure the model of online course. For instance, the course can be focused on learning objectives based on getting theoretical knowledge or promoting practical skills depending on the type of general needs. Figure 2 shows an example of map that displays a limited set of concepts describing a course model which can be applied in an online context.

The highlighted concepts (black boxes) represent the selected instructional issues derived from the input requirements. For example, the kind of learning goals addressed to promote creative abilities or the type of learning activities which consist in tasks that are part of projects and assessed by means of rubrics. Then, the obtained concept map is used to explore potential relationships between the selected instructional issues and the technological-based concepts involved in a VLE platform. In this case, the Domain Mapping process is addressed to find out concepts representing VLE features which could be applied in a specific instructional context.
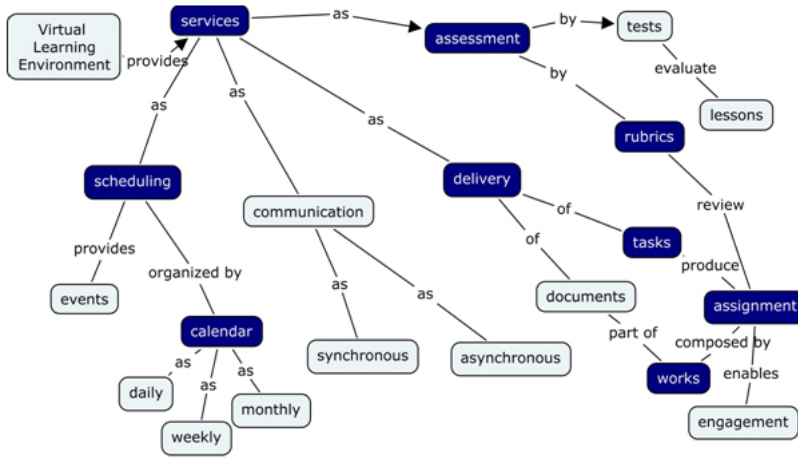
Fig. 2 - Example of concept map about a course model

Figure 3 shows a partial view of a concept map highlighting the VLE features which are addressed to meet the stated instructional requirements. The black boxes represent services provided by a generic VLE platform which could be used to support activities in the selected online course model. For instance, an assignment service can be oriented towards the delivery of lab-based tasks or the selection of a weekly calendar to schedule such tasks boosting the students' engagement. The selected concepts and relationships should help the instructor in the generation of teaching guidelines as final outputs of the proposed approach structured in three parts: i) the VLE functionalities as services or tools of a specific platform used in an online course, ii) the possible teaching or instructional actions derived from the application of VLE tools specified previously and iii) the potential learning outcomes that could take advantage from the observed instructional application.

Fig. 3 - Excerpt of the VLE concept map

4 Application of the approach

The current section describes the application of the proposed approach to an example of online course supported by a specific VLE platform. The course example is about "Operating Systems" (Buendia *et al.*, 2009) which is a core topic in most of the Computing curricula of undergraduate and Master's programmes. The selected VLE platform is called Poliformat (Mengod, 2006) and it is based on Sakai, an open source, web-based collaboration learning environment (Berg & Korcuska, 2009). The approach application is centred on the use of Poliformat and it follows the steps displayed in Figure 1, starting from the elicitation of instructional requirements attached to the online course teaching "Operating Systems" and finally, obtaining some kind of guidelines to meet the stated requirements. The "Operating Systems" course has an intermediate level and it is focused on developing practical activities concerning basic operating system services. Some other instructional requirements can be introduced:

- The course students are characterized by a learner profile with a usually good knowledge level about theoretical concepts. However, they have more difficulties with programming disciplines. Traditionally, the students' behaviour shows low engagement in the course activities.
- The subject features are focused on technical issues about specific operating systems (e.g. POSIX calls) which require a high level programming skill.
- The lab tasks require problem-solving skills to tackle analysis and design situations. The interaction with the teacher is usually low during these

activities and autonomous self-paced learning is encouraged.
- The course evaluation is based on assessing the lab tasks. These activities are scaffold from simple tasks to more advanced problems to be solved.

Once the instructional requirements have been set up, this information can be used to configure the instructional concept map of the online course and to select the main items to characterize it. The mapping between instructional issues and technological VLE services can help to generate teaching guidelines in a systematic way by providing a complete list of VLE features and suggesting their potential instructional applications. Table 1 shows some examples of teaching guidelines which can be obtained as outputs of the approach.

TABLE 1
Examples of VLE-based teaching guidelines

VLE functionalities	Instructional actions	Learning outcomes
A weekly calendar should be used to	notify the starting of tasks...	controlling the course workflow
	annotate task deadlines...	boosting the student's responsibility
A resource repository should be used to	store handouts about...	connecting with Operating System basics
	provide technical reports...	offering a realistic approach of the subject
	highlight Web references...	enabling research skills
An assignment tool should be used to	propose lab tasks concerning...	enhancing a practical approach to Operating System management
	control the delivery of task works...	improving the student's engagement
		assessing the student's performance

5 Discussion

After the description of the proposed approach and their application in a specific learning setting, several aspects can be discussed in the context of the support to generate teaching guidelines when VLE platforms are used.

First, it can be considered the lack of approaches to guide instructors who are using educational technologies in their online courses. As aforementioned, organizations as the UNESCO and several national teacher associations are deeply interested in assisting instructors in this context and they have publi-

shed some reports and guides with this purpose. However, most of the current approaches are based on providing general recommendations or conceptual guidelines which can be useful as a generic report about online teaching but they are unable to give the adequate support to instructors in a specific technological-based learning setting. Moreover, some educational technologies such as VLE platforms are becoming more and more a common tool for instructors but their growing dimension and complexity are leading to produce an important gap between the instructor requests and the potential services these platforms can provide. Therefore, it is quite reasonable to formulate approaches such as the one described in the current work to reduce this gap.

Second, the rationale for the proposed approach can be discussed to judge its adequacy to the problem to be solved. In this sense, there are several initiatives addressed to generate instructor guidelines for online teaching settings in a systematic way. Usually, such initiatives face the challenge of considering online courses as a software engineering product so that they propose the use of formal notations such as educational ontology formats or model diagrams to elaborate these guidelines. However, many of these proposals fail to give instructors a perspective they can understand or the solutions they provide are bounded to specific VLE platforms. The current approach is based on representing instructional and technology issues which are part of an online course by means of concept maps which can be considered as a semi-formal notation. It means that concept maps do not provide a strict semantic formulation but they can be translated to other formal notations which are able to be processed in a systematic way. The main advantage is that concept maps are well-known by instructors since they are used to elaborate and evaluate them in many learning contexts. This closeness to instructors makes possible to allow them to actively participate in the generation of the teaching guidelines adapted to their specific requirements.

A third question is about how to check the real effectiveness of the proposed approach or its usefulness for their potential customers (tutors or instructors). At this moment, the approach is only a conceptual framework which needs to be developed and evaluated. A prototype of Web application has been implemented in order to allow instructors the management of the concept maps which are part of the approach operation. This application permits to store concept maps in a database format so that the information about such maps can be queried and used to produce the required teaching guidelines. A fully developed application would enable a more rigorous evaluation by means of questionnaires submitted to teachers when they apply the proposed approach in specific learning contexts.

Conclusion

The current work has presented an approach to support the generation of teaching guidelines for online courses in a systematic way. The proposed approach has been based on a framework called TAGGE (Teacher Assistance Guideline Generation Engine) which is based on modelling the knowledge items about instructional and technology issues by means of concept maps. An example of conceptualization process has been developed to represent the features and services provided by VLE platforms and link them to instructional applications.

The proposed approach has been applied to an example of online course teaching Operating Systems. This application has demonstrated how the process of generating teaching guidelines could be supported by conceptualizing those instructional and technological issues which are part of an online course. The approach application has been complemented with the development of a Web application that enables the mapping of the concepts which are part of the technological domain to the instructional concepts. Further works plan to improve this Web application allowing instructors to check the approach usefulness.

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