Let me do it: towards the implementation of instructional patterns of ICT usage in schools

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Abstract: We present the design of an online environment that provides mechanisms for the exploitation of school ICT infrastructure by empowering teachers to discover and comment on educational activities that can be implemented in their schools.

Keywords: School ICT Infrastructure; Learning Scenario; Pattern; Teacher support; Experience report; Ontology; Knowledge base

1 Introduction

Facilitating the use of ICT at school has been often done by the creation and distribution of learning scenarios or by systematic training. However, these two approaches have systematic drawbacks. Learning scenarios, generally widely made available on the web, are presented as simple reproducible stories. It should be possible for non-technical persons to embrace technology scenarios and guidance from resources, in a confident way for her particular case. This paper discusses the approach of a collaboration project with schools and academic partners from three European countries called *eSIT4SIP* (Empowering the School IT infrastructures for the implementation of Sustainable Instructional Patterns, Erasmus+ project). We map scenarios, infrastructure and design patterns [Be00] which provide general solutions for recurring problems with respect to the relevant aspects of the school ICT infrastructure when implementing learning scenarios. The developed tools shall allow users to search for relevant teaching materials and inspiration at different levels of abstraction. The constituent components of our approach are a) the description of educational activities, b) the Knowledge Base that captures and disseminates domain knowledge, and c) the matching algorithm that maps patterns to school infrastructure.

2 Describing Educational Activities

A number of projects have focused on the mining of best practices in learning design and teaching in terms of instructional design patterns. Examples of such projects are the

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Pedagogical Patterns Project [Be12], the Kaleidoscope Network of Excellence [Pr06], the TELL[8] project, and the PCeL pattern repository [DMP04]. Results from several initiatives on the collection of such patterns can be found in the recently published compendium [Mo14]. The problem is that they typically lack a link to a description of the suggested ICT infrastructure. This makes it difficult for teachers to foresee which demands and changes to the infrastructure are required to implement them. Hence, our approach is targeted to produce guidance notes, scenarios, and patterns for the effective use of the existing ICT infrastructure and equipment available in the educational institutions.

While scenarios and patterns offer ways to prepare teaching setups, they fail at showing the actual applications. For this reason, the eSIT4SIP knowledge base includes experience reports which describe actually experienced learning activities connected to the infrastructure, the scenarios and patterns that were used. They constitute an important enrichment of scenarios and patterns to demonstrate their feasibility.

3   The Knowledge Base and Matching Algorithm

We aim to deliver a Knowledge Base (KB) that allows teachers to plan for the technical realization of learning scenarios within their premises. It is based on the knowledge of the ICT facilities of the schools, that is, the infrastructure required to achieve the functions described in each of the scenarios. The infrastructure descriptions are meant to be used in two processes: when a teacher plans a lesson, he or she selects existing scenarios or at least design patterns that are compatible. When a media specialist or school principal plans the purchase of new ICT facilities, he or she will want to know the achievable patterns and scenarios so as to guide the choices. For these processes to happen automatically, we thus require a description language for infrastructure that will allow to categorize and describe each school's infrastructure. The Knowledge Base employs knowledge encoded in three distinct but interconnected ontologies: the *functions* ontology, which describes the functions described in the scenarios. The *educational practices* ontology, which requires knowledge on scenarios, instructional patterns and experience reports. The *school infrastructure configurations* ontology, which requires knowledge on the configuration of the school infrastructure. The organization of the knowledge in the form of ontologies allows us to create a knowledge base system that is valid long term and that can be adjusted by the use of axioms or rules. In our approach, we would like to support the use of different levels of abstractions by the application of design patterns and scenarios in combination with the linking to concrete infrastructure descriptions. In order for teachers to map patterns or scenarios they are interested to to school infrastructure the following algorithm will be used: ellicit the particular dimensions of the application (number of students, time, school...), extract the abstract infrastructure requirements of the pattern and instantiate them to the particular dimensions. This algorithm allows to search for applicable scenarios and patterns.

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[8] Towards Effective network supported collaborative learning activities `https://www.gsic.uva.es/proyectos.php?lang=en&pId_p=3`.

4 Discussion

The technical feasibility of a learning scenario which indicates whether the school infrastructure is sufficient to implement the scenario is a crucial factor for its adoption by the teachers [ML15]. In addition, teachers need to be able to assess relevance of the scenario to their local context using their professional knowledge, and then identify possible variations of a scenario for its implementation with their own school infrastructure. After the completion of the project the KB along with the educational activities will be freely accessible online.

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