EnAbled: A Psychology Profile based Academic Compass to build and navigate students' Learning Paths

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Abstract. In the modern educational environment students are faced with a plethora of different options in their learning journey during the University years. To help them to make optimal choices among all these options, that best correspond to their individuality, we have conducted a research project "Enabled: Educational Network Amplifying Learning Experience" (EnAbled). The project aims at "mapping" these choices to personal preferences and individual learning styles. We allow students to either self-assess their profiles or use the Lumina Psychological Traits of Behavioral Preferences tests. We argue that this approach will be beneficial not only to the students but also to the academics assisting them in the preparation and delivery of modules and providing them with more insight into what and how teaching is delivered.

Keywords: eLearning, Psychological Profiles, Threshold Concepts, Strategies for Online Learning.

1 Introduction

In modern days, students face a plethora of different options in their learning journey during the university years. From the classical approach of attending lectures and tutorials to learning from online videos or participating in fora and tutorials - there are so many possible paths and approaches that it is becoming difficult for students to make an informed and optimal choice among available resources. Furthermore, it also becomes challenging for lecturers to prepare modules which optimally make use of all these resources. To overcome this "over choice" dilemma, we have conducted a research project "Enabled: Educational Network Amplifying Learning Experience" (EnAbled) [2] presented in this paper. The EnAbled project provides a software tool to assist lecturers to build their modules by considering different approaches and the students to choose between learning paths based on their inclinations.

We target first year students who find themselves in a transition period, or "liminal" space [5] – a period of time over which they make the transition from an observational learner, who learns from examples, "mimicry" or reverse engineering, to a learner, who can handle difficult abstract concepts and techniques. We pay attention to the notion of "threshold concepts" [1] – those "building blocks" that students develop and use during

this transitional period. These concepts are not only different from the "didactic" concepts that form the basis for the classical educational model but often cannot be explicitly expressed by the students. Our contribution is the interpretation of Threshold Concepts in the Use Case as edges in the module conceptual map (see Section 3).

The project also creates "Academic Compass", a digital platform, which students use to navigate across various learning options guided by both their preferences and learning styles and previous learning experience. Lecturers, in turn, use the platform to model their modules encompassing the various options available at each learning stage. In our pilot study, we used qualitative methods to collect data required to build students' individual learning profiles. Subsequently, these profiles were exploited in the Use Case that models the revision sessions for a first-year module, "Mathematics for Computing". We discuss the results of the conceptual testing of the proposed solutions showing their contribution to assisting students in building their autonomous learning and helping academics to tune the delivery of material based on individual needs,

2   Concepts and Model of the EnAble Project

EnAbled adopts a metaphor of a Compass which helps the students to navigate through a map of learning pathways as if they were crossing a new territory with this map and a compass. Modules of their curriculum are modelled as graphs that encompass multiple routes and each path is made of several steps (Learning Objectives) connected by edges (Learning Activities).
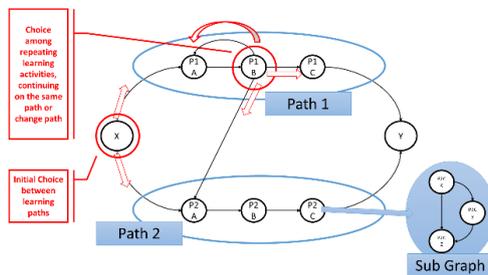

A graph model of a module, with each node potentially further detailed in a sub-graph:

this is a two-layered graph model with two upper level paths (P1 and P2) and the sub-graph describing one node (P2C).

**Fig. 1.** Graph-Based Model of the Learning Paths in EnAbled.

We allow students to define their individual learning profiles either self- assessed or by taking the Lumina Spark Behavioral Preferences test [6]; This allows to "map" students' choices of what, how and when to learn using personal preferences and individual learning styles based on Kolb's model [4]. We argue that this approach will also benefit academics assisting them in the preparation and delivery of modules and providing them with a deeper reflection of what is taught and how it is taught. **Fig. 2** illustrates the project concepts: a Module Builder (A) is used to create a two-layered graph which represents various learning paths and where each node is connected with relevant teaching materials. Once the module setup is completed, the students are able to navigate through the EnAbled compass tool (C). It suggests to the students an optimal choice

based on a color-based decoration of each path linked to the student profile. Students can either take the (B) Lumina tests to discover more about their profiles or simply auto-assess them when they first use the digital compass.
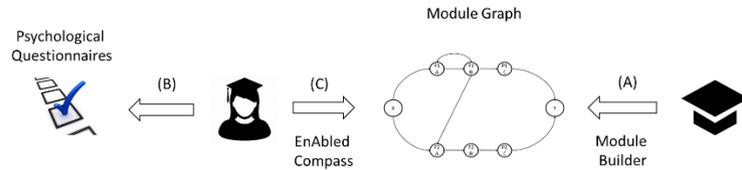
Fig. 2. Building and Navigating through Modules with EnAbled

The EnAbled Academic Compass suggests students would make choices, which is based on their psychological and learning profiles, whilst academics will utilize this framework to model various learning paths.
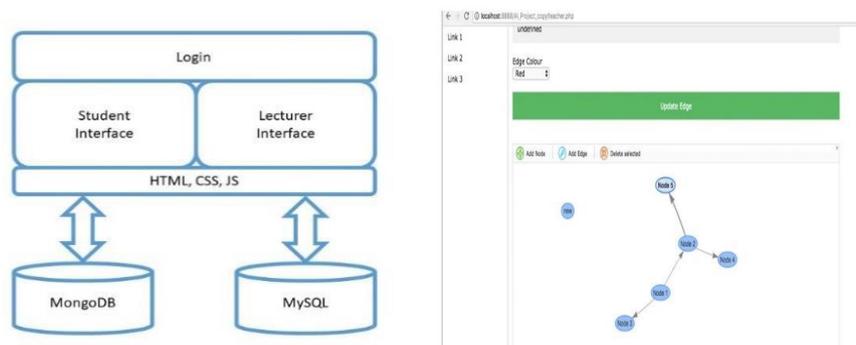

Fig. 3. The Architecture of the EnAbled Prototype and Graph Editor screenshot.

3   The Prototype and the Use Case

Figure 3, on the left, presents the main prototype's modules. The Login module authorizes users to either the Student or Lecturer modules, and saves user details to a MongoDB database through a JavaScript interface. The Student Interface integrates the information from the psychological profiles with updated information on the status of the student (e.g. the amount of time available to execute the next Learning Activity) and presents various learning paths associated with each topic created by the Lecturer. The Lecturer module creates various graphs associated with different learning paths, by using a drag and drop tool as shown in Fig. 3 on the right. The Graph Editor allows to update nodes with necessary links, while edges represent Learning Activities and can be associated with metadata information - the duration and color coding used to define preferred choices based on the student profiles and current situation. The module content including its graph structure is saved in JSON format in the MongoDB database.

Figure 4 shows the Use Case – first year module "Mathematics for Computing", which was used for Prototype testing.
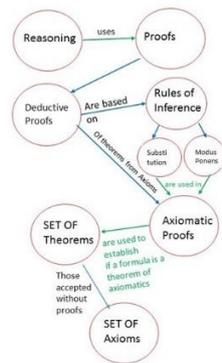
A route to revise a Conceptual Map of the module suitable for the "Abstract Conceptualization" style. "Threshold concepts" are transitions – this is much closer to what students operate with in their practice [3]. Traversing the graph from the leaf - "Axiomatic Proof" a student would follow a blue line leading to this concept from the node "Deductive Proof"; the threshold concept here links "Axiomatic Proof" with "Deductive Proof" as its type. The green lines leading to "Axiomatic Proof" would lead a student to the two types of rules – substitution and modus ponens that *are used* in axiomatic proofs.

Fig. 4. Graph Representation of the Use Case

4   Conclusion.

This paper presented and discussed a prototype of the EnAbled Academic Compass to assists students with their choices. The theoretical grounds are students' psychological and learning profiles and conceptualization of the module content reflecting threshold concepts. The effectiveness of its approach will be fully tested during the Academic Year (2018-2019). The first prototype will be further developed and tuned to be ready for testing by students and lecturers at the start of the next (2018-2019) Academic Year.

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