

Learn2Learn Buddy: Virtual agents to support the learning process

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Abstract. Many students have difficulties with specifying, planning and carrying out their individual master thesis project within the nominal time allotted to it in their study programme. We propose to explore the potential of using virtual agents as buddies for the master thesis execution phase. A Learn2Learn buddy that matches with learning styles will be prototyped and tested with representatives of the target group and their coaches.

1 Introduction

In an era of constant distractions in the form of portable phones, CD players, computers, and television, it is hardly surprising to discover that many students have not learned to self-regulate their academic study very well [11]. Psychologists and educators have long considered the role of motivation in student achievement and learning (for a review see [4]). It is recognized that besides cognitive skills, students need motivational will to do well in studies [5]. In 1997 the UK National Committee of Inquiry in Higher Education recommended that students should have tools to help make the outcomes of learning more explicit, identify the achievements of learning and support the concept that learning is a lifetime activity. More specifically, many universities face a prolonged bachelor or master thesis project phase. These are typically projects that need to be carried out individually. Particularly, in programmes that includes lots of team-based projects as a (valuable!) teaching form, this is a sharp contrast once the student is confronted with the assignment for a thesis project. These projects require the student to choose a topic, to delineate the subject by means of formulating a do-able research question or design objective, to develop a do-able research plan including the choice of suitable research or design methods, choosing a theoretical point of departure and to act as his/her own project leader over a prolonged period of time. These challenges can lead to prolongation, which has financial effects for the educational institutions (if funded on the basis of completed thesis projects). But prolongation also raises the risk of students to stop with their master thesis project and to never obtain their degree, leading to societal loss of knowledge exploitation and personal loss to the student.

Studies show that students can enhance their academic performance by becoming aware of their own thinking as they read, discuss, otherwise gather information and solve problems [6]. This consciousness raising has dual benefits: (1) transfers responsibility for monitoring learning from lecturer to student, and (2) promotes positive self perception, affect and motivation amongst students.

In this paper, we present ongoing work on “*learn to learn*” support tools. Our aim is to develop systems that provide help in developing key learning skills, such as goal setting, time management, learning strategies, self-evaluation, self-attributions, seeking help or information, and important self-motivational beliefs, such as self-efficacy and intrinsic task interest. In particular, we will develop a virtual coach or buddy that can assist the student on these processes and helps individuals reflect upon and plan their own learning. While the responsibility is placed on the learners to plan their own learning, to act on the plans and to generate evidence of learning, the tool will support the following processes:

- planning (how to achieve objectives or general change)
- doing (learning through the experience of doing with greater awareness)
- recording (thoughts, ideas, experiences, evidence of learning through writing, audio, video, visual or other means)
- reviewing (reflections on what has happened, making sense of it all)
- evaluating (making judgments about self and own work and determining what needs to be done to develop/improve/move on)

2 Learning styles and support for thesis process

Identifying students learning styles helps educators understand how people perceive and process information in different ways. Learning style refers to the individual’s preferred method for learning. People learn best when the learning environment matches their learning style. According to Vermunt [10], students characterised by an *undirected* learning style have problems to process the material for study, experience difficulties with the amount of study material and with discriminating what is important and what is not. Students with a *reproduction* directed learning style are characterised by a study behaviour directed mainly on reproducing what is learnt at examinations, in order to pass these successfully. Students with an *application* directed learning style try to employ what they learn to actual, real-world settings. Finally, students with a *meaning* directed learning style wish to find out what is meant exactly in their study material, interrelate what they have learned and try in a critical sense to develop their own view. Learning styles have been found to determine academic success [2]. In particular, Busato, et al. (2000) found a significant, positive influence of a meaning directed learning style and intellectual ability, and a significant, negative influence of the undirected learning style on academic ability.

Motivation influences how and why people learn as well as how they perform. Motivation is based on different aspects. In previous work, we have explored the relation between e-learning processes and materials and student’s learning style as determinants of study results and motivation [1].

In this project, we focus in particular on the master thesis component of academic programmes. In many cases, a master thesis will be the first substantial piece of independent scholarship an student produces. Besides the obvious academic skills, including knowledge of research methods and strategies, students often need guidance on how to frame a question of reasonable scope and on the development of a reasonable chronology, setting a number of short- and long-term deadlines for the completion of

various stages of the project. This is of special importance since novice researchers may lack reliable intuitions as to the length of time that any particular part of the project is likely to require. Students also benefit from guidance on finding and evaluating relevant content, and knowing who they can consult on specific aspects of their project. Furthermore, given the increasing number of students required to write graduate theses in a language other than their first, typically English, there is a need to counterbalance the difficulties encountered by these students, e.g. using ESL (English as Second Language) exercises tailored to support the writing of scientific dissertations.

Given the differences in academic results for different learning styles, it is necessary to deploy resources to support the learning process in a way that adapts to the characteristics of each student. In the context of Information Technology evolution and the availability of electronic media, the idea of matching e-learning based approaches to appropriate teaching and learning styles has been explored since the late 90's. There are many studies on the effectiveness of combining multimedia and hypermedia with learning styles in educational systems [9]. The resulting, individualised learning systems, provide students the capability to select the mode of delivery and timing of module material. An important step in the design of instruction and its methodologies is the identification of student needs and learning preferences.

3 Learn2Learn Buddy

There is increasing interest in embodied agents (or avatars) and the effects on human cognition and motivation, and in particular on the use of embodied agents in e-learning environments. These agents must be capable of performing tasks and achieving goals individually and in collaboration with other agents, both human and nonhuman. When considering interaction with students, it is of particular relevance that the virtual agent is able to adapt to the learning context, the learning style and the specific aims of the student. Currently a wide range of architectures and functionalities are being proposed for animated embodied agents and significant work has been undertaken on incorporating conversational behaviours of emotion, personality, conversational performatives, and persuasive techniques into animated embodied agents [3, 7]. Sklar and Richards [8] provide an overview of the state of affairs in the use of agent-based systems for human learners. They focus on "implementations that employ intelligent, autonomous agents" and present several types of agents that can be used in learning systems: pedagogical agents, peer learning agents and demonstrating agents.

In this project, we will explore the potential of using virtual agents as buddies to support master thesis students and their coaching teachers in their master thesis project execution. In particular, the system must be able to interact naturally with the user, access and present content and context relevant information adapt to the learning style of the user, and employ emotion and persuasion to engage and motivate the student. In the following, we provide a rough sketch of the project phases:

1. Exploration. Literature research and requirement elicitation, taking into account relevant social and pedagogical trends: What type of learning experience or knowledge is required? Who are the stakeholders and their requirements on learning objectives?

2. System architecture: The system will incorporate several interacting agents: An Embodied Conversational Agent (ECA) will be used as user interface; information agents will gather information from different sources (course management systems), library information systems and timetables. A user modeling agent is responsible for the maintenance of user profile.
3. Affective behaviour design. Determine the choice of the most suitable intelligent system: a pedagogical, peer-learning or demonstrating agent.
4. Prototyping. A prototype of the buddy system, including the user interface and affective behaviour will be developed according to requirements.
5. Usability Evaluation. Test the prototype with representatives of the target group of users of the system: master thesis students, their coaching teachers and other support professionals such as study advisers.

4 Conclusions

In this paper we presented ongoing work on developing tools and methods to support students and educators in the process of "learning to learn". The objective of this research project is the creation of teaching methods and environments that use the vast resources offered by IT in such a way to adapt teaching material and strategies to the learner's skills and learning style. We use learning style models and will explore the relation between e-learning and learning styles in the context of an thesis support system. In this paper, we present the general proposal for developing a 'learn to learn' buddy combining and adapting teaching strategies, learning styles and e-learning.

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