

Towards a Student Advisory System for E-learning

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Abstract

Web-based courses are being introduced by higher education institutions at an increasing rate, such that a systematic shift from face-to-face teaching to web-based teaching has become evident. This enthusiasm in web-based education is primarily driven by cost savings and bottom line net profits to institutions. However, research work in the field still has a long way to demonstrate the effectiveness and benefits of web-based learning in general and more specifically, which student can benefit most. Regardless of all the benefits reported, difficulties are still encountered by students, professors, and institutions alike. In fact, many studies show that the web environment for learning is not appropriate for everyone. Therefore, the primary question should be “who is appropriate to take web-based courses?” This of course is in the context of success as it relates to enhanced learning experience and improved performance.

Considering the reported benefits and difficulties, this paper identifies seven factors characterizing student success in a web-based learning environment. In addition, we use those factors within a decision support advisory system to help screen students for their appropriateness to take a web-based course. The system was used with few students and this paper reports on one case. The advisory system identifies unfavorable conditions for success to the student and suggests remedial activities to enhance the student’s success.

Keywords: eLearning, Computer skills, Internet skills, Advisory, Personality, Culture, Anxiety, Trust

Introduction

The Web is being extensively used by educational institutions worldwide to deliver courses electronically. At the same time, they are attempting to enhance and improve the student learning experiences by using a wide range of media and web technologies. Many studies today show that the Web facilitates the delivery of tests and supports distance learning (Shiffler, 1999; Burks, 2004) and a systematic shift from face-to-face teaching to web-based teaching is evident. In fact,

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many complete and accredited degree programs are now offered over the Internet. Sunal (2003), Saade (2007), Saade and Kira (In Press), Saade and Bahli (2005) have studied and report on results indicating that web-based learning support this shift and has shown that using the Web as a teaching tool is at least as effective as that in the traditional classroom.

Despite the global enthusiasm in web-based education, it is not evident that all students can benefit. In fact, many studies show that the web environment for learning is not appropriate for everyone. It seems that the web environment is targeted to a particular group of students with a specific set of skills, pre-dispositions, and attitudes toward online learning. Online learners need not only to feel comfortable, but also appreciate the dynamics of an online setting. They must understand how learning takes place in terms of interactions, relations, and perceptions amongst learners-to-teachers and learners-to-digital content. Students may have expectations of being taught or instructed, and may feel uneasy with the professor's new role of facilitating, guiding, and mentoring as opposed to directly instructing students.

On the one hand, web-based learning benefits include cost effectiveness and access to learners unable to attend traditional classes. However, many researchers have found that the benefits experienced by both students and instructors extend further (Cereijo et al., 2002): Asynchronous nature of online learning; flexibility in scheduling into daily life activities; and personalized feedback. On the other hand difficulties are still encountered: Online courses may tend to be time consuming if excessive reading off the screen is required; communication with the instructor is not face-to-face which may lead to the feeling of isolation; the potential pitfall of time mismanagement by inexperienced and undisciplined students and the idea of being an independent individual may not be suitable for all students.

Considering the nature of online learning, it is important to provide students with advice about their readiness to participate in the virtual environment. Motivated by the development of a 'student care system', we started by developing and testing a simple advisory system to help students achieve the following objectives: (1) evaluate their strengths and weaknesses influencing participation in the virtual environment and (2) obtain suggestions to ameliorate their weaknesses. Within the context of online learning, students are motivated to use the system because of the help that they will receive and which may lead them to better performance. We initially identified seven factors characterizing students who are well-suited to benefit from the virtual environment for learning. In addition, we use those factors within an advisory context to help screen students for their readiness (strength/weaknesses) to take the online course and provide feedback on their inputs.

Overall System Design & Factors

Given the variety of benefits and difficulties for participating in online courses (as discussed briefly in the previous section), it is important to identify an initial set of factors which may influence online learning environments. Establishing a complete set of factors is important in order to accurately classify students: (1) who are well-suited to benefit from this learning medium and, (2) who have the personality to manage the difficulties associated with online learning and (3) who possess the skills to use virtual environments effectively. Meeting those objectives and establishing a complete set of critical success factors is our core research plan. In this study we present and report on our initial attempt of this research plan.

The system developed is composed of all the components of a typical decision support system: Database, Knowledge, Inference Engine and User Interface (see figure 1 below). A schematic view of the system showing the sub-components and their inter-relationships is given in figure 1 below.

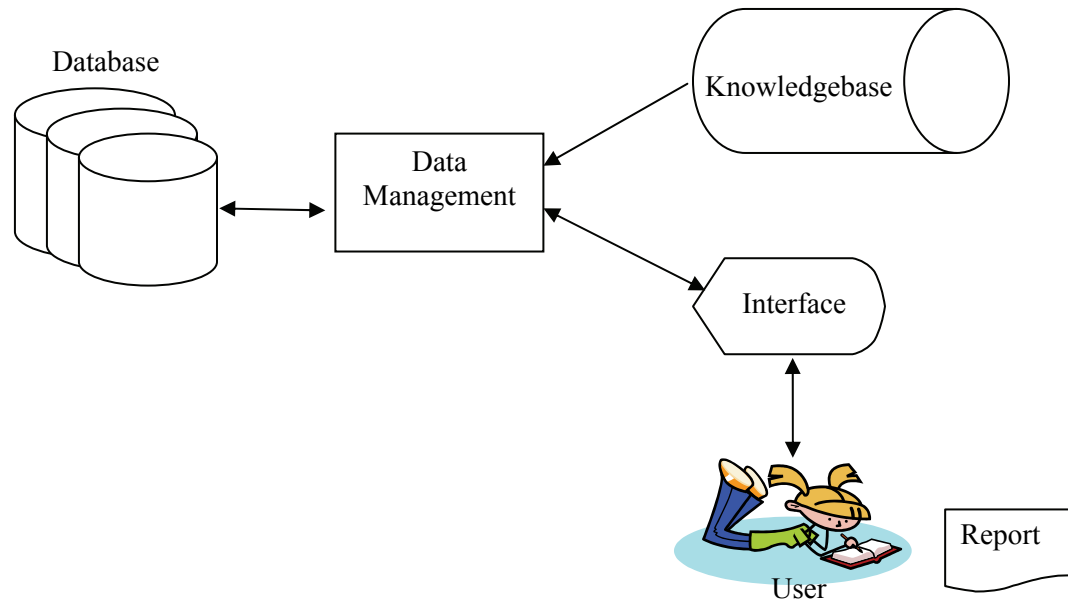


Figure 1: Schematic view of the decision support system components.

The system functions using a simple scoring approach. The knowledge base of the System is composed of the seven factors mentioned above. The score at which each student obtains from his/her answers for each variable is associated with an appropriate explanation. Depending on the student's answers, specific recommendations are provided. Each factor has a weight for the final score. This weight defines the relative significance of each factor to the total objective of the system output. Given that we are in the exploration stage of our research and the lack of significance data for the seven factors (relative significance or influences on student success in online learning), equal weights were assigned for all variables, each having 14.28%. This is a preliminary step for the design of this system; future inference techniques such as genetic algorithms or neural networks will be used to "train" the model and find the optimum weighting for each factor.

The variables we used in this study, and described below, are: computer skills, Internet skills, student personality, cultural factors, learning styles, anxiety/trust, and time allocation. These factors are in line with variables reported by other researchers in online learning studies (Saadé, 2003; Saadé & Kira, In Press; Saadé & Bahli, 2005; Saadé & Otrakji, 2007; Saadé, 2007).

Computer and internet skills: All studies point to the significance of previous experiences in computer and internet skills in the successful completion of an online course (Wegner et al., 1998; Blocher et al, 2000; Brinkerhoff & Koroghlanian, 2005). It would be expected that individuals with more computer experiences would have greater advantage in taking/managing online courses over those who with little experience. Moreover, students who perceive computers as difficult to use and unreliable can be disadvantaged in managing an online course. Today most online courses use web based technologies. Therefore increasingly, courses are using features of course management tools, such as discussion boards and chat rooms, and the use of such web-based communications technologies can be rather challenging for novice internet users.

Student Personality: Research indicates that the ideal student for online courses is one that is intrinsically motivated, responsible towards deadlines and submission dates, and well organized. An ideal online student personality would play positively to ensure the student maintains his/her motivation and interest in the course and does not fall behind with his/her online course workload. Self-management, self-monitoring, and motivation appear to be even more essential for suc-

cess in an online course than in the face-to-face classroom (Willging & Johnson, 2004; Keller & Suzuki, 2004).

Cultural Factors: Researchers have come up with numerous definitions describing culture. Francesco and Francesco and Barry (1998) describe culture as “something (as in the case of morals, laws and customs) that shapes behavior or that structures one's perception of the world.” Individually, every person is different, but he/she shares many similarities and values with others he/she grew up with. When it comes to distance learning, cultural factors can exhibit a strong influence on the student's success in the course. For example, some cultures and values may not appreciate the distance learning idea and may favor a more hands-on approach to learning.

Learning Styles: Learning styles describe the method by which a student feels he/she learns best. Student skills which are important for the face-to-face learning environment may not necessarily be adequate for learning via the World Wide Web. The online learning environment has a different set of student skill requirements. For example, consider the activity of collaborating in virtual groups (absence of face-to-face interaction with other students and the instructor). Moreover, enhanced online learning was shown to increase the chances of success if student participate actively and have a strong willingness to learn (rather than just aiming to pass the course) (Doohun Lim, 2005).

Anxiety & Trust: It has been shown that many students feel anxious doing course work on the computer. However, this anxiety decreases as they become more familiar with the interface and functionality. Computer anxiety is defined as the fear that results when an individual is about to use a computer. Previous research shows that this anxiety level is directly correlated with experience. The more experience the user has, the lower his/her anxiety level and the higher the likelihood that he/she will feel more comfortable in an online environment.

A person's trust of Internet based systems is also vital for student success in an online course. The security that a student feels while using the course web site and the confidence he/she has in his/her internet connection attribute towards the overall success of individually learning online (Igbaria & Chakrabarti, 1990; Ganzel, 1998).

Time Allocation: Time allocation represents the benefit that online learning offers to students by allowing them the freedom to tend to their studies at their own time and pace. For example, parents can look after their children, and then sit down to class; working students can attend classes even with a full work schedule. Time allocation is effected by environmental factors such as demographics and learning needs. Conditions such as employment, living arrangements, and distance from campus offer an indication of whether attending a class on campus proves to be a hassle.

Questions to capture the factors discussed in the previous section were used as input to a simple system designed to provide advice to students on their appropriateness and/or readiness to take a web-based course.

Methodology

The factors identified above were measured by a questionnaire which was used to capture the student's characteristics. Table 1 lists the seven factors, and describes what each factor aims to measure and the number of items used to measure each factor. The items for the factors are adapted from previous existing instruments (Cereijo et al, 2002; Goldsmith, 2001; Dorwick, 2003)

Table 1: Factors characterizing students' appropriateness for web-based courses.

Construct	Measurement Aims	Questions
Computer Skills	Are the student's computer skills sufficient for taking a web-based course? <i>Measure to:</i> Access to PC / Comfort in using a PC / PC basic skills	5
Internet Skills	Are the student's internet skills sufficient for taking a web-based course? <i>Measure to:</i> Access to internet / Internet usage skills (chat, forum, music...)	4
Student Personality	Is the student's personality inline with recommended personality traits for taking a web-based course? <i>Measure to:</i> Motivation / problem solving / ability to work independently / self management and organization	4
Cultural Factors	Does the student's culture accept web-based courses as a means for learning? <i>Measure to:</i> face-to-face learning perceptions / personal cultural beliefs about online learning / social norm in using computer and internet / family	4
Learning Style	Is the student's learning style compatible with learning in a web-based environment? <i>Measure to:</i> Importance to classroom discussion / reading comprehension / written expression / propensity to communicate freely using different media	5
Anxiety/Trust	Does the student have any anxiety or trust issues that may affect his/her performance in a web-based course? <i>Measure to:</i> Disclosing personal information / comfort in communicating via the internet / trust in the internet medium / nervousness of online environment / perception of quality of information posted online	6
Time Allocation	Does the student's lifestyle necessitate his/her to take a web-based course? <i>Measure to:</i> Distance of home from campus / employment / lifestyle / special learning needs	4

All questions were measured using a five-point Likert-type scale with anchors from "Strongly disagree" to "Strongly agree."

Case Study

To demonstrate the usability of this system, we tested the system on a few students. The study involves students at the John Molson School of Business at Concordia University, Montreal, Canada. We present only one case due to space limitations. The student selected is male, 21 years old and in his third year of undergraduate studies. The student volunteered to use the system. The

student experience while using the system is composed of two stages: the interrogation stage and the feedback stage.

The student who was assigned a login username and password first, logged into the system. The session started by prompting the student with one set of questions at a time. The student (during this interrogation stage) completed a 32-item questionnaire measuring the seven factors. Completion of stage 1 was followed by a student feedback report identifying strengths and weaknesses. A final decision on the readiness of the student was provided at the end. The test case results were made anonymous and are shown below:

Dear Mr. X

Below are the results from your interaction with the advisory system. The objective of this system is to evaluate your characteristics critical for your success in this web-based course. Read them carefully. Note that the positive (+) and negative (-) signs beside each bullet point identifies your individual score on the factor in question (+ = favorable; - = not favorable).

- **[+] Computer Skills:** You have the basic computer skills and easy access which makes you a potential student for web-based courses. You seem to know how to use a PC quite well.
 - **[+] Internet Skills:** You have the adequate Internet Skills, which is an important factor to consider before registering for web-based courses.
 - **[+] Student Personality:** Your answers have shown that you have a certain level of discipline and motivation, which are key success factors in web-based courses.
 - **[+] Cultural Factors:** Your cultural background supports you in web-based courses for learning. Your family values and your cultural beliefs are favorable to your use of online courses.
 - **[-] Learning Styles:** Your learning style does not correspond with the ideal style desirable for web-based learning. In class learning is apparently more in tune with your learning needs. You need to research your options to adjust your learning style for a web-based environment.
 - **[+] Anxiety/Trust of Online Systems:** Your level of comfort in a web-based learning environment is ideal for participation. You have also reported to be comfortable in disclosing personal information online, which will ease your communication with others online.
 - **[-] Time Allocation – Lifestyle:** You do not seem to have enough time to spend on a web-based course. Even though web-based courses are flexible, they require that you spend at least 5 to 8 hours a week on them.
-

Recommendation:

Out of 7 factors critical for your success in this web-based course you possess 5 that are favorable for your successful completion of the course. However, pay attention to the two factors that you scored low and develop strategies to mitigate their negative effects on your course experiences and performance. If you have any questions, print this page and discuss it with your professor.

Discussion and Conclusions

It is from our perspective that students in higher educational institutions are primarily given the opportunity to become better individuals by experiencing an environment of collaboration, collegiality, critical thinking and support, all of which are conducive for learning. The implication to this viewpoint is that students are provided with tools to help them better understand their strengths and weaknesses while at the same time make a genuine effort to help them succeed and attain excellent performance. The internet has the potential to significantly help in this regard, and to that effect, the concept of an entire class having ‘As’ would be viewed as a successful attempt to bring students to the next knowledge level. It is in this spirit that this project was conceived and it is in this direction that it is headed. The vision is ‘student care’.

Looking at the system presented in this paper, the elements of knowledge base and explanation facility are of utmost importance. Since the knowledge base is created independent from the system core program, it could be easily managed. So for example, the comments can be more interpretative and may include links to resources in case the student scored unfavorably. Moreover, the explanation facility can provide students with the rationale for the decision and a better understanding of his/her weaknesses.

Systems are all designed with limitations. In this case, the system assumes equal weights among all seven factors. This is not necessarily true. In fact it is not evident in the literature which one is more important than the other. Many methods can be applied to address this issue. At this point in our research, we are scanning all the literature and evaluating any quantitative data to each of the seven factors and assessing the feasibility of using them as different weighting influences. Another approach that we have also initiated is to create a normative database which we then can use any method such as genetic algorithms, fuzzy logic, or artificial neural networks to enhance the system in terms of predicting the likelihood a students' obtaining an 'A' grade in the course and if that likelihood is low, then what can be done to get closer to our performance objective.

Higher educational institutions are not necessarily geared towards student care. Even though they may claim to be; only a few are in fact. Additionally, the academic community seems to have stagnated within the limitations of the 'no-significant-difference'. Web technologies can be used to break free from the status quo. It is time for a new paradigm.

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