

Identifying students' trends toward personalizing Learning Management System (LMS) at Zarqa University (Extended)

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Abstract

Filtering information according to user's preferences and needs is the focal point of personalization. Personalization as a business model has been used successfully in the e-commerce world by many organizations. The aim of this paper is to work on a proposed e-learning system based on the principle of personalization over the Learning Management System (LMS) available at Zarqa University – Jordan introduced earlier [1]. A questionnaire is delivered to students taking the course 'web (1)' at the IT College to measure students' perception toward personalizing the LMS. The obtained results will be used for further studies to expand the study over more university students at Zarqa University for more general adoption of the idea of personalization in e-learning environment.

Keywords: Personalization; Students' Styles; Scaffolding; Recommender Systems.

Introduction

Filtering information to best suit user's needs is one of the main concerns in any e-learning environments. Personalized systems are key tools and common techniques for reducing the information overload and enabling users to quickly find information that is most valuable to users [2, 3, and 4].

Personalized systems "are computer systems designed to help people find preferred items within a very large set of available alternatives (e.g., movies, books, news) in order to provide effective, tailored advice (i.e., to predict whether the user will like/dislike a particular item)" [5]. According to them [5] personalized systems can make use of three different sources of information about their users: (i) user demographics (e.g., user's age, gender), (ii) user preferences about features of the items (e.g., the movie director) and (iii) user ratings on experienced items (e.g., previously seen movies). All these sources of information can be effectively combined (e.g., Popescul, A., et al. 2001)".

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Several techniques are currently used to measure users' trends towards the adaptation of personalized systems. These techniques involve off-line analysis using evaluation methods like machine learning and information retrieval. It is argued that while off-line analysis is useful, student's satisfaction with a recommendation strategy can only be measured in an on-line context. Researchers should know the best way to evaluate e-learning systems. Haughey and Anderson [6] mentioned that Evaluations in e-learning have tended to focus on the quality of the experience and its impact on collaborative learning and higher-level learning skills. On this research an offline questionnaire was delivered to students because it is the only way available to retrieve information from students since the Learning Management System at the university is restricted only for course work.

Personalizing and motivation are key successes factors in any e-learning environments; these factors will lead to increasing and enhancing the student's achievements in the course production [7]. The aim of this research is to measure students' trends toward personalizing the Moodle, the Learning Management System (LMS) available at Zarqa University. A questionnaire was delivered to 30 students divided into two sections taking a course named 'special topics in programming (1)'. Data obtained from questionnaire was analyzed using a well known package called Statistical Package for Social Science (SPSS). The results showed that there was a positive perception towards adopting the idea of personalization. So a model of a personalized e-learning system relying on LMS is proposed.

The course 'web (1)' was selected because it is a compulsory requirement for all students at the IT College at Zarqa University. Also this course can best suit the idea of personalization. The populations of the study are students who have very good experience in using the Learning Management System (LMS) at the university, so they can answer the questionnaire which was designed carefully to evaluate the LMS available at the university and to measure the students' trends towards personalized e-learning systems. Other students of the university are using the LMS, but not in the same manner like IT College students. For future studies, the populations of the study could be expanded to other students in different university colleges to make better understanding and to confirm students' trends toward personalization.

The results of this research combined with the results obtained in [1] can also provide practical benefits of information technology practitioners and universities as regards issues in successful design and implementation of e-learning systems in education. When planning to develop and to apply a new technology tools like personalized systems, universities will be able to predict whether these technology tools will be acceptable to students. At the same time, universities will be able to diagnose the reasons why a planned information technology may be embraced by students or not. As a result of the benefits gained from the current research, correction

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or adjustment can be made to increase the rate of information technology adoption by integrating new technology tools like what is known as recommender systems RS in the e-learning environment in Jordan.

The next phases of this research will focus on: students' styles and scaffolding, LMS description, questionnaires design and analysis, structure of the proposed system, and conclusions and future works.

Learning Styles and Scaffolding

The e-learning process is highly affected by technology. The rapid increase in inventing new hardware and software open the door to benefit from these inventions in e-learning environment. The technology provides a new environment for classroom discussion; where students can interact with each other and their tutors, share knowledge and work together to do their activities. The way the students read and study now is different than before. Instructors should take these issues into consideration. Understanding the student's needs is very important issue in designing a computer course system [8].

Indicating Students' Learning Styles

In the e-learning environment, students should be classified based on their learning styles on what is known as students modeling. There are many ways used to indicate the student's learning styles, Watkins [9] recommended to use questions like the following in order to begin acquire information about student's learning styles in e-learning environments:

- **Subject: Primary Learning Style is Visual.** A learner may prefer visual elements in his or her instruction, so we can ask what study skills does he/she believe are most useful in the online course environment. As an example, drawing pictures or mind maps as he/she reads online materials, paying special attention to the images or animated graphics, and/or envisioning the topic in your thoughts.
- **Subject: Primary Learning is Auditory.** A learner may prefer auditory elements in his or her instruction, so we can ask what study skills does he believe are most useful in the online course environment? As an example, developing an internal conversation between them and the text, reading aloud, and/or discussing the topic in verbal conversation with a peer, family member, or colleague at work.
- **Subject: Primary Learning is Tactile.** A learner may prefer tactile elements in his or her instruction, what study skills do they believe are most useful in the online course environment? As an example, taking careful notes while reading online material, using a pencil or highlighter to mark their notes, using an online highlighter (for example, with PDF files or Microsoft Word documents), and/or keeping an online journal". Table 1 can help in classifying students according to their learning styles.

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Table 1: Learning styles inventory [9]

Concentrating	Does seeing untidiness or movement distract you? Do you notice things in your visual field that other people don't?	Are you distracted by sounds or noises? Do you prefer to manage the amount and type of noise around you?	Are you distracted by activity around you? Do you shut out conversations and go inside yourself?
Visualizing	Do you see vivid, detailed pictures in your thoughts?	Do you think in sounds and voices?	Do the images you see in your thoughts involve movement?
Auditory	Do you dislike listening for a long time? Do you often use words such as see, picture, and imagine?	Do you enjoy listening? (Or maybe you're impatient to talk?) Do you often use words such as say, hear, tune, and think?	Do you like to gesture and use expressive movements? Do you often use words such as feel, touch and hold?
Contacting people	Do you prefer direct, face-to-face, personal meetings?	Do you prefer the telephone for intense conversations?	Do you prefer to talk while walking or participating in an activity?

Supporting Students' Learning (Scaffolding)

In an e-learning environment, students may sometimes feel isolated from others and this may not allow them to progress with the course. So there should be some ways in supporting students to make a balance between course production and students' progress in the course. Ormond [10] mentioned some examples of students' support like supporting students by writing, by phone and audio-visual media. Also, students should have technical support to develop their learning and computer skills.

Scaffolding describes the type of assistance offered by a teacher or peer to support learning. In the process of scaffolding, the teacher helps the student master a task or concept that the student is initially unable to grasp independently [11]. Scaffolding occurs through personal interaction and should be done within the course environment. Scaffolding depends on the ability of learners. Skilled instructors provide the right amount of scaffolding to help while keeping learners challenged. Then, instructors should gradually remove scaffolding when they feel that learners have reached the desired level of knowledge and dominated their activities.

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There are two types of scaffolding, soft and hard scaffolding. Soft scaffolding is dynamic and requires educators to diagnose the learner's understanding and provide adequate support based on their responses [12]. Performing scaffolding individually to learners can be extremely difficult for educators when dealing with large sections and in a very short time. Scaffold software can provide assistance to learners.

Another type of scaffolding called hard scaffold (or technological scaffold) is used to provide routine support at various stages of the learning process. It is called hard scaffold because it provides static support that can be anticipated and planned in advance based on expected learners difficulties [12]. Hard scaffold is divided into directive and Socratic scaffolds [13]. Sharma and Hannafin [13] stated that "Directive scaffolds address procedural and skill based learning and are used for young children and novice learners". Wood [14] provided examples of context intelligent tutoring systems based on Vygotsky's zone of proximal development, which helps children aged 10–11 years learn about food chains and webs, provides appropriately challenging activities and the right quantity and quality of assistance. Habib and Sønneland [15] stated that "The concept of Zone of Proximal Development (ZPD) is itself intimately connected to the collaborative aspects of learning, whereby the focus is on the participation in socio-cultural practices". Drachsler et al. [16] commented on Vygotsky's (ZPD) by stating that "The main recommendation goal for Technology Enhanced Learning (TEL) recommender systems is to provide learners with suitable learning activities in order to support their competence development". The second category of hard scaffold is called Socratic scaffolds'. According to Sharma and Hannafin [13], "Socratic scaffolds are more for mature learners and address analytical complex thinking and metacognitive learning".

Scaffolding is not only used to guide learners through their complex tasks, it may also problematize important aspects of students' tasks to force them to engage with key disciplinary frameworks and strategies [17]. Scaffold software can provide assistance to learners; this assistance should help learners engage in some activity without making that activity too easy or automatic to perform since too much simplification would be detrimental to learning.

Providing scaffolds to learners in Problem-based learning (PBL) environments until they master a concept or activity has proven to be beneficial in the development of autonomous and competent learners. Ngeow and Kong [18] stated that "PBL is an educational approach that challenges students to "learn to learn".". After mastering a concept or an activity, the instructor may fade the support. Fading written supports may help problematize student work. Problematizing student work makes learning tasks more difficult in the short term, but ultimately promotes student learning [17].

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Learning Management System (MOODLE)

There are many e-learning systems available for use in many universities and educational institutions like: Moodle, WebCT, Eduwave, and Renzoli. Some are commercial and some are free source.

One of the well-known e-learning systems which are used in the case study conducted for this research is Moodle. Moodle is an open source course management system (CMS) that Universities, community colleges, K-12 schools, businesses, and even individual instructors use to add web technology to their courses [19]. According to Cole and Foster [19], more than 30,000 educational institutions are using Moodle all over the world to deliver online courses to supplement the delivery of traditional face-to-face courses. Rice [20] stated that “the word Moodle stands for Modular Object-Oriented Dynamic Learning Environment, which is mostly useful to programmers and education theorists”. This system is used at Zarqa University-Jordan, the place at which this study was conducted.

Questionnaires

In order to complete a successful search for knowledge and understanding, various methods that are systematic and thoroughly clear are to be used to reduce any risk of bias. But how does any one determine the most suitable method of obtaining the information needed? There are different methods for collecting data such as participation (focus group), observation, analyzing documents, questionnaires, and interviews [21]. If the data that will be gathered is subjective information, such as trends and perception, then the appropriate research methods that may suit the study more are questionnaires [22]. Since this study is based on measuring students' trends toward personalizing the LMS at Zarqa University, then questionnaires method is chosen for this study.

Design of the Questionnaire

According to Harvey [22] the following recommendations have to be considered when designing a questionnaire. Firstly, an introduction should be presented to explain the purpose of the questionnaire. Then, instructions on how to fill the questionnaire could be helpful. In addition, the questions should be simple and consistent style should be used. Furthermore, the questions should be arranged in a logical order with thanks statement to be included at the end of the

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questionnaire. Finally, including codes for responses will help when the analyzing process is carried out.

The more structured the question is, the easier it will be for the researcher to analyze. According to Youngman [23] seven types of question can be introduced: verbal or open, list, category, ranking, scale, quantity, and grid questions.

Summary of the Questionnaire

The questionnaire included twenty one questions. The main aim of the questionnaire was to try to discover some of the student's learning styles to be recorded later in their profiles. In the proposed model, the recommender system will work in the student's profiles to divide them into different groups (one student can be part of more than one group) in order to produce recommendations to students according to their preferences" i.e. the recommender system will give an additional link for the material to be presented in different format (Audio files, PDF, etc..) files in the Learning Management System (LMS) according to the student answer for this question. Also, some of the questions will be used to measure the student's trends towards the online learning in general.

The questionnaire included (yes-no), multiple choice, and scale questions. In some of the questions (open-ended) a space was provided to students to answer the question, if they think that there is another answer to the question being asked, but it was noticed that no student filled the open-ended questions.

Analysis of the Questionnaire

Results from the questionnaire strongly suggest that online learning enhances and complements face-to-face learning and emphasize on the need for integrating new technologies. In the first two questions of the questionnaire, the purpose was to understand how students think of online learning and face-to-face learning. The majority of the students (73.3%) for question 1 and 92.1% for question 2 agreed or strongly agreed on the value of online learning in enhancing and complementing face-to-face learning. Both groups emphasize on the value of online learning and that could make it easy for them to accept new technologies related to e-learning systems like the recommender systems.

Question 4 also gives similar results when most of the students (92.1%) appreciate the value of the LMS as an e-learning system in helping the students to understand the course material.

For questions 3, the purpose was to try to discover some of the students' learning styles. The results showed that (10%) like audio files, (9.4%) like graphics files, (67.3%) like PowerPoint

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Presentations, and (13.3%) like to have video files. These results will help the recommender system in the proposed model to tailor the LMS interface in different ways according to students' preferences (answers).

Asensio [24] stated in a survey that compares the two systems, "in the face-to-face environment it appears that the participants valued the social dimension of seeing each other, of chatting, of laughing and the immediacy of communication". While on the other hand, Asensio [24] stated, "The participants reported that the discussions were more reflective, and the dialogue is richer than in the face-to-face settings".

In identifying the way in which materials and resources should be presented, it has been found in question 5 that (30%) of students preferred the material to be presented by topic, (23%) of students preferred the material to be presented by lecture, (25%) of students preferred the material to be presented by week, and (22%) preferred the material to be presented full in advanced for all the semester. The material can be presented in four ways: by topic, lecture, week, or full in advance. Students can have more than one topic in each lecture and more than one lecture in each week. The results (the different styles according to the nearly equal percentages) of these questions give an indication that the way that the material and resources is presented now (full in advanced) could be revised at least for the resources or could be improved by integrating recommender system to the LMS, so the recommender system can tailor the material to students according to the way they like to have.

The purpose of question 6 (a and b) and question 14 was to capture information about the students which may help to build knowledge about their styles and behaviors, (i.e. whether they are interactive or not. The majorities of the students were interactive and already participated in the chat group and know the value of the feedback link.

The purpose of questions 7, 8, 9, 11, 15, 16, 17, 18, 19, 20 and 21 was to get some history information (demographics and preferences) about student. This history information also includes students' experiences with dealing with computers and IT in general so the recommender system can recommend some training material to be taken before getting into the course. In Addition, the recommender system in the proposed model will work on students' answers for building their profiles.

Haughey and Anderson [25] stated, "E-learning activities and experiences are easily captured to be studied, evaluated or re-used as needed". So in an online environment it is important to make sure that material presenting is best suited to students so, it will be easy to be reused. But any way, as mentioned above the aim of this question was to emphasize the students' role in

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changing the way in which the material is presented. Harasim [25] stated, "In the most successful online course, students assume some of the roles that traditionally belong to the instructor".

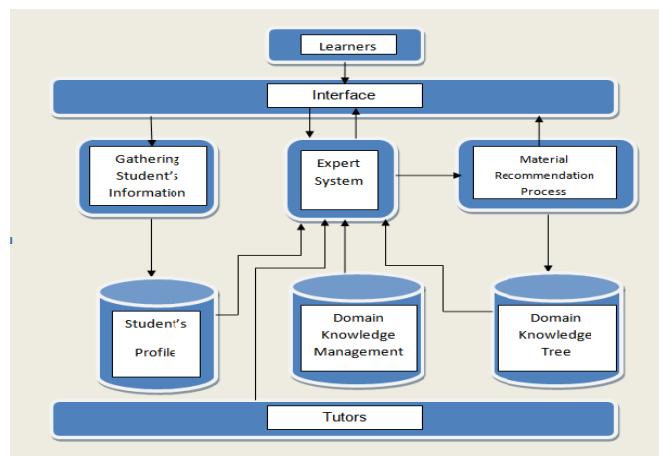
Many authors in many articles [24, 25] agreed that e-learning is an interactive environment, the findings of question 10 discovered that (37.4%) of the students accessed the LMS website daily, (22.0%) of the students accessed the LMS website every (2-3) days, and the rest of the students (40.6%) accessed the website in almost a weekly basis. The findings indicates that the LMS website is interesting and exciting because more than half of the students accessed the website within three days, but the percentage could be improved.

For question 13, (39.4%) of the students agree or strongly agree that the manual tutor's comment link for the assignments was helpful, but more percentage of them (56%) were not sure whether the link was helpful or not, however, a small number of students (4.6%) were unsatisfied with the tutor's comment link. These findings do not give a clear indication about the value of this link, because comments are made by each tutor, so it differs when more than one tutor added their comments, so there is no clear evidence whether this link was helpful or not.

Q14 was designed to measure the value of the online quiz link. The results showed that the majority (88.7%) of students appreciate this link. This may help the researcher in evaluating the proposed system at later stages after implementing the model.

Proposed Model

The main components of the proposed model are shown in figure 1. The model consists of six main components: gathering students' information (GSI), students' profiles (SP), domain knowledge management (DKM), domain knowledge tree (DMT), expert system (ES), and material recommendation process (MRP).



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Figure 1 the proposed Model (Atair and Al Hamad, 2005) [26]

The students interact with the system through the LMS interface. Students' information gathering is achieved by asking them to fill out the prepared questionnaire, therefore, the students initially register to the system, during which some personal settings are saved in the students' profile. The students' profiles consist of student's style, background, type (part time, full time), their preferences, interests and knowledge levels etc. In addition, students' profiles may contain students' answers to the online quizzes. The tutors interact with the system by designing the questionnaires, setting the online quizzes, presenting the material into chapters that are further divided into topics. Then identifying the external material related to each topic. The recommender system, as shown in figure 1 utilizes the data stored in students' profiles, and data received from domain knowledge tree and domain knowledge management to make inference and fire recommendations to students through the user interface. The material recommendation process relied on matching the facts and rules in the expert system.

Conclusions and Future Works

In this study, the main aim was to propose a personalized e-learning model over the Learning Management System (LMS) available at Zarqa University – Jordan. The findings of the study showed that the students perceived the proposed system. This strengthen the assumption that student's are welling to deal with new technologies and to accept the technology if it add a value to their achievements. Student's trends towards accepting and dealing with new technologies for enhancing their performances give proposed model more credits to be accepted. Personalizing and motivation are key successes factors in any e-learning environments; these factors will lead to increasing and enhancing the student's achievements in the course production.

The future work will focus on implementing and evaluating the proposed model. The evaluation process will rely on comparing two different groups' performances based on the online quizzes, the group that use the normal LMS and the group that will use the new personalized system.

References

- [1] AlHamad., A., Salameh, M. and Makhareez, L. (2013), "Identifying students' trends toward personalizing Learning Management System (LMS) at Zarqa University". Proceedings of the Third International Conference on Digital Information Processing and Communications (ICDIPC2013). Islamic Azad University(IAU), UAE Jan. 30, 2013 -Feb. 1, 2013.
- [2] E. Turban, D. King, Introduction to E-Commerce, Pearson Education Company, 2004, pp. 154-155.
- [3] P. Jackson, Expert Systems, Addison-Wesely Comp., 1999, pp. 2-5.
- [4] O'Mahony M.P., Hurley N. J. and Gu'enol'e C.M. Silvestre. Detecting Noise in Recommender System Databases. IUI'06, January 29–February 1, 2006, Sydney, Australia, pp. 109-115.

"This research is funded by the Deanship of Research and Graduate Studies in Zarqa University /Jordan"

- [5] Carenini, G., Smith, J., Poole, D. (2003). Towards more conversational and collaborative recommender systems. In: Proceedings of the 2003 International Conference on Intelligent User Interfaces, January 12-15, 2003, Miami, FL, USA, pp. 12-18.
- [6] Haughey, M., & Anderson, T. (1998) Networked Learning: The pedagogy of the Internet. Montreal: Cheneliere / McGraw-Hill. Pp.120-138.
- [7] L. Lee and TC. Lu, (2002). "Intelligent agent-based systems for personalized recommendations in Internet commerce" Expert Systems with Applications Vol. 22 (2002), pp. 275-284.
- [8] Fee, K. (2009). "Delivering E-Learning: A Complete Strategy for Design, Application and Assessment". UK, London: Kogan Page Limited, pp. 27-36.
- [9] Watkins, C. (2005). "Classrooms as Learning Communities: what's in it for schools". London: Routledge, pp. 112-136.
- [10] Ormond, S. (2002). "Supporting students in online, open and distant learning (The opon and flexible learning series)". UK, London: Kogan Page limited, pp.52-75.
- [11] Lipscomb, L. Swanson, J. and West, A. (2004). 'Scaffolding'. In M. Orey (Ed.), Emerging Perspective in Learning, Teaching and Technology. [Online] available from <http://projects.coe.uga.edu/epltt> [November 20, 2012]
- [12] Saye, J. and Brush, T. (2002). 'Scaffolding Critical Reasoning about History and Social Issues in Multimedia-Supported Learning Environment'. Educational Technology Research and Development. Volume 50, Number 3, pp. 77-96.
- [13] Sharma, P. and Hannafin, M. J. (2007). 'Scaffolding in technology-enhanced learning environments'. Interact. Learn. Environ, 15(1), pp. 27-46.
- [14] Wood, D (2001). 'Scaffolding, contingent tutoring, and computer-supported learning', International Journal of Artificial Intelligence in Education (2001), 12, pp. 280-292.
- [15] Habib, L. and Sønneland, A. M. (2009). 'Elevator to the communal scaffold? – An analysis of the social and pedagogical aspects of VLE use in a Bachelor programme', Brookes eJournal of Learning and Teaching, 2(4). [online Journal]
- [16] Drachsler, H., Hummel, H. and Koper, R. (2008). 'Personal recommender systems for learners in lifelong learning networks: the requirements, techniques and model'. International Journal of Learning Technology, v.3 n.4, pp .404-423.
- [17] Reiser, Brian J. (2004). 'Scaffolding complex learning: The mechanisms of structuring and problematizing student work'. Journal of the Learning Sciences: 13(3), pp. 273-304.
- [18] Ngeow, K., and Kong, Y. (2001). 'Learning to Learn: Preparing Teachers and Students for Problem-Based Learning'. [ERIC digests]. Bloomington, IN: ERIC Clearinghouse on Reading, English, and Communication, 2001. [Online] available from <http://www.ericfacility.net/ericdigests/ed457524.html> . [July 1, 2012]
- [19] Cole, J., Foster, H., and O'Reilly. (2007). 'Using Moodle: Teaching with the Popular Open Source Course Management System (Using)'. Community Press, 2007, pp .1-7.
- [20] Rice, W. (2006). 'Moodle E-Learning Course Development: A complete Guide to Successful learning using Moodle'. UK, Birmingham: Packet Publishing, page 5.
- [21] Denscombe, M. (2000). 'The good research guide for small-scale social research projects'. USA: Open University Press, pp. 87-158.
- [22] Harvey, J. (1998). 'Evaluation cookbook'. UK: Heriot-Watt University, pp. 50-55.
- [23] Youngman, M.B. (1986) 'Analysing social and educational research data'. UK: McGraw-Hill, pp. 95-110.
- [24] Asensio, M, Foster, J., Hodgson, V.H & McConnell, D. (Eds). (2000). 'Innovative approaches to lifelong learning and higher education through the Internet'. Proceedings of the second international conference organised by Lancaster University and the University of Sheffield held at Lancaster University., pp. 280-285
- [25] Harasim, L., Hiltz, S.R., Teles, L., & Turoff, M. (1995). 'Learning networks: A Field guide to teaching and learning online'. USA: Library of Congress Cataloging-in-Publication Data, pp. 123-143.
- [26] Atair, M and AlHamad, A. (2005). "Expert Personalized E-Learning Recommender System (EPERS)" Proceedings of the First International Conference E-Business and E-Learning EBEL 2005. Amman – Jordan. (2005).

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