

# A Web Based Generation System for Personalization of E-Learning Materials

Ozlem Cakir Balta, Nurettin Simsek, and Nezaket Tezcan

**Abstract**—It is believed that, in our day of designing everything to individual specific, to personalize the education would also effect learning in a positive way. There are researches asserting that, if the mathematical word problems are phrased to students in a personalized way, the success, attitude, motivation and interest of the students' raises. These researches also point out that, manual personalization takes too much time. Thus, the usage of information technologies appears to be a necessity in personalization studies. The Personalized Learning Material Generation System aim the presentation of lessons specific to individual, exercises and tests by using the objects, people or places the individual likes. With this Content Generation System, the materials are associated with the students' daily lives and thus the content is personalized. As a result of this, to raise the attention to the lessons becomes possible.

**Keywords**—Material generation system, Personalized material, Personalized learning, E-learning.

## I. INTRODUCTION

At the present day, everything, including the coffee shop chains to restaurants, banking services to the selection of multi-channeled programs, is all designed based on the personal choices (Diack, 2004). The personalization gradually occupies more space at many areas of our lives, as in education. Only an actually personalized education can discover the rising genius, can define the total of the human abilities and assist to the development of these abilities. Thanks to the personalized education, both the student and tutor (teacher) can study with the best program for themselves (Keefe, 2007).

Personalized instruction is accepted to be the most hopeful phenomenon to benefit the potential of information society (Karagiannidis, Sampson & Cardinali, 2001). On the contrary to the conventional instruction system, at which students try to adapt themselves to the concept, personalized learning advocates that the concept has to be adapted to the individual student (Karagiannidis, Sampson, and Cardinali, 2001). The educational community studying the personalized education (compatible and intelligent), has attracted a respectable

attention since they have developed the technology forming the education content (Karagiannidis, Sampson & Cardinali, 2001).

As Jonassen and Grabowski (1993) points out the direct effect of personalization to learning, Bates & Wiest (2004) say that personalization raises the motivation and interest which are critical in learning process.

Many researches have revealed the positive effects of personalized problems formed by adapting the names and information from students' personal former experiences to the problems they solve, on the cognitive learning outcomes like interest, motivation, understanding. These researches (Anand & Ross, 1987; Bates & Wiest, 2004; d'Ailly, Simpson & MacKinnon, 1997; Davis-Dorsey, Ross & Morrison, 1991; Hart, 1996; Ku & Sullivan, 2002; Lopez & Sullivan, 1991, 1992; Ross & Anand, 1987; Ross, McCormick & Krisak, 1985; Ross, McCormick, Krisak & Anand, 1985) attest the positive effects of personalization on the mentioned parameters.

In literature, the concept of personalization has had some different meanings time by time. Keller and Sherman (1974) approaches to personalization as "Personalized System of Instruction" (PSI). According to this approach, personalization means carrying on the applications by individual steps and providing one-to-one relationship between student and teacher. However, according to Howe & Howe (1975), personalization includes the implication of students' aims and interests to the program and as a result of this, maintaining a model for the success and correction of the behavior of the students that distract the concentration and disturb the class. On the other hand, Jonassen & Grabowski (1993) define personalization as the interaction of the individual with environment and especially with the other people. Jonassen & Grabowski (1993) has specified that the personalization to him is the theory of inclusion of the classification of all personal dissimilarity. According to Mayer (1984), personalization eases giving meaning to the student's existing informative schema and association of this schema with external information. Personalization has been defined as putting the person's individual needs in the center of his/her life and building his/her life on this base by Diack (2004). In this study, the personalization term is accepted as providing the interaction of the person with environment and especially with the other people.

The personalization of the instruction is provided by student oriented instruction which is succeeded by embodying

Dr. Cakir Balta is with the Faculty of Educational Sciences, University of Ankara, Turkey (corresponding author, phone: 0312-3633350; Fax:0312-3636145; e-mail: Ozlem.Cakir.Balta@education.ankara.edu.tr)

Dr. Simsek is an associate professor of Computer Education & Instructional Technologies Department and director of Distance Education Center at Ankara University, Turkey (e-mail: nsimsek@ankara.edu.tr).

Nezaket Tezcan is a student with the Faculty of Computer Engineering, University of Atilim, Turkey (e-mail: nezaket.tezcan@gmail.com)

the instruction based on student's individual needs (Diack, 2004). Personalized instruction assists students by adapting personal choices and interests in the learning context (Chen & Liu, 2007). On the contrary to the conventional instruction system, at which students try to adapt themselves to the concept, personalized learning advocates that the concept has to be adapted to the individual student (Karagiannidis, Sampson & Cardinali, 2001).

In this study, personalization is used as the adaptation of the new information in order to make it much more familiar to the students. What is intended to be told is the formulation of the instruction's main context based on the students' former lives and interests. This model, first announced by Ross, McCormick, Krisak & Anand (1985); Ross & Anand (1987); and Anand & Ross (1987) raises the students' perception ability. Other researchers (Davis-Dorsey, Ross & Morrison, 1991; Ku & Sullivan, 2002; Lopez & Sullivan, 1991, 1992), in parallel with Anand and Ross (1987), define personalization as directly relating to the person's experiences and using verbal qualifiers on this subject.

Today as the educational approaches change, the lessons are studied by mentioning about more attention attracting subjects and by giving examples related to daily life in order to provide better understanding of the students, instead of forcing them to memorize. Personalization is a concept rising from this context. For example, mathematical word problems are the challenging kind of problems for students. The first and most important part of the solution of the problem is the comprehension of it. The correct solution depends on the correct comprehension (Tatar & Soylu, 2006). There are researches asserting that personalization of problems has benefits in overcoming this problem (Anand & Ross, 1987; Bates & Wiest, 2004; Chen & Liu, 2007; Davis-Dorsey, Ross & Morrison, 1991; Hart, 1996; Ku & Sullivan, 2002; Lopez & Sullivan, 1991, 1992).

The researches have revealed personalization of mathematical word problems raises understanding (Davis-Dorsey, Ross & Morrison, 1991; Ku & Sullivan, 2002) and could change attitude to mathematics (Hart, 1996; Ku & Sullivan, 2000, 2002; Lopez & Sullivan, 1992; Ross, 1983, Ross et al., 1985). Researches who don't agree on this, say that personalization could draw the student's attention and this has considerable benefits to learning.

As observed in the researches, there were two options in case of personalization of mathematical word problem: Group personalized, and individually personalized. Group personalization is using generalizable concepts in subjects of personalization (learning characteristics, interests, past experiences, favorites, etc.) (Ku & Sullivan, 2000). Individually personalization is that using available variables based on students one by one (Ku et al., 2007).

Two ways in personalization of mathematical word problems are paper based or computer based presentations. Because of preparing paper based personalized tests' difficulties (Bates & Wiest, 2004; Ku et al, 2004), researchers tend to group personalization instead of individual

personalization (Ku & Sullivan, 2000). In group personalization, instruction is designed using common interests of group, on the other hand individual personalization is designed using individual interests of each student. Inconvenience of this process is that students are deprived of benefits of individual personalization because students faced only group personalization.

As mentioned above, personalization is a very time consuming process if it is done manually. For example, in a class total of 20, only writing the names-surnames of the students would take 20 minutes. Besides this, when student specific information like the student's friends' names, the food he/she likes are concerned, preparing one question including all of the these would take too much time. However, developing a database of these names, likes, dislikes and many more individual data and personalization of the instruction by computer would avoid this waste of time, shorten the time needed almost to a few seconds. In this study, this program is designed with a vision of using personalization not only for mathematic exercises but also for the other lessons with the same positive effect.

In this study, individually personalized computer programs infrastructure explained.

## II. WEB-BASED PERSONALIZED LEARNING PROGRAM

A database is designed to use the personal data for the personalization of learning material. In order to gather the data to be used at parametric fields in the personalized materials, a questionnaire like personal data inventory is given to the students. A single naming (mother\_name, father\_name,...etc) is used for each question in this inventory. This naming data is used as parametric fields at the material preparation grade. The questions can have multiple answers. The questions which ask for data that could possibly create a negative effect can be associated with another replacement question.

The personal data to be used at the system is classified as "self related", "mother related", "father related", "sister/brother related", "friend related", "shopping", "way" and "hobbies". The personal questions, which are to provide group specific personalization, are defined using the "Personal Questions Menu". In definition, both the style of answers (multi answer/ single answer) and the type of answers (proper noun, text, numeric, yes/no, formula) are set.

As the next stage, the questions designed in the given structure are answered by the students. At the answering stage (Student Information Menu), a different screen is displayed for each subtitle. While, under the subtitle "self related", name, surname, age and such data is requested, for the "hobbies" subtitle, "What is your favorite toy?", "What is your favorite sports?", "What is the name of your favorite novel?" and likewise data is needed to be entered. According to the conditions defined in the design, different answers could be gathered. Although not a 100% success can be provided, the accuracy of answers is checked by controls of being numeric, proper noun or yes/no statement. As a

consequence, questions (these questions are used as parameters in material generation) are formed with the data used at parametric fields and answered by the students.

The third stage is the design of personalized material. Three types of parametric field are used in material design. The first one, the parameter of personalized question replied by students (mentioned above); the second one, the data of "cases of nouns"; and the third one, the formula of question pattern and the formula fields used in the questions.

While, the personalization in English could be done by only changing the name of the given object, it is hard to succeed this with texts in Turkish. Since Turkish is a suffixed language, the cases of nouns/pronouns are crucial in keeping both semantic and structural coherence in the process of personalized material preparation.

As an example, the answer to the question "What is the name of your best friend" would be different for each student. It could be "Sonnur" for one and "Ali" for another. For the accusative case, it is targeted to change "Sonnur'u", "Ali'yi" while using these names in sentences for the answers. In this way, semantic and structural coherence would be kept. As seen in the example, according to the vowel in the last syllable, the accusative case changes to "-i/-ı/-u/-ü". A study to compile the behavior of the noun cases enclosing such situations has also been done.

Differently from the personalization process in the other studies, in this study, in addition to names of friends, places, locations, it is also possible to change numeric values such as age or the cost of the favorite object. For the test input, example question entry is done as below:

#### Personal Data Used

Your Name: *Aslı*

The food you most like to buy from market: *chocolate*

How much is the food you most like to buy from market: *4*

The case of noun used: *ablative,*

The Formula used:  $C \text{ (Cost)} = I \text{ (Item)} * P \text{ (Price)}$

The format entered as template:

Soru:

<ADINIZ> düzinesi <MARKETTEN EN ÇOK ALMAK İSTEDİĞİNİZ YİYECEĞİN FİYATI KAÇ YTL'DİR><Formül:F> YTL olan <MARKETTEN EN ÇOK ALMAK İSTEDİĞİNİZ YİYECEK><İSMİN DEN HALİ> 72<Formül:A> tane alırsa kaç YTL öder?

Çözüm:

<Marketten en çok almak istediğiniz yiyecek><İSİM TAMLAMASI> <A> adeti kaç düzine eder onu bulalım.

$x = \langle A \rangle / 12 = \langle x \rangle$  düzine çikolata eder.

Bizden istenen  $\langle x \rangle$  düzine çikolata fiyatıdır.

$\langle x \rangle \cdot \langle F \rangle = \langle y \rangle$

Cevabın Formülü(Verilen cevabın doğruluğu bu eşitliğe göre değerlendirilmektedir):

$(A/12)*F$

For student *Aslı*, this material will be transforming into form as stated below:

Soru:

*Aslı düzinesi 4 YTL olan çikolatadan 72 tane alırsa kaç YTL öder?*

Çözüm:

*Çikolatanın 72 adeti kaç düzine eder onu bulalım.*

$x = 72 / 12 = 6$  düzine çikolata eder.

*Bizden istenen 6 düzine çikolata fiyatıdır.*

$6 * 4 = 24$

Cevap:

$(72/12)*4 \Rightarrow 24$

Both of the inputs, here, are parametric (how much is it and which product he/she buys). Since the price will change for each student, also the answer will be different for each. Because of this, the inputs used for the answers and the solutions are both designed as parametric. Thus, at assessment stage, even the answers of each student is different, by evaluating the answers to personal questions, the answers will be marked as correct.

Following up the stages explained above, the lesson contexts of the groups, including subject presentation, exercises and texts, are designed as personalized. The presentation of these lessons is implemented by Personalized Learning Material Generation System or as output of learning materials.

#### A. The User Roles in Personalized Learning Material Generation System

There exists three different users in the web page: Administrator, Instructor and Student.

The administrator is the most authorized user. In addition to all rights of the other users, the administrator, edits the classes of the students and instructors.

The instructor is the user who edits the personal questions and prepares the subjects, exercises and tests using parametric fields, providing compatibility to personalized education.

The instructor user teaches the student group which is defined to that user. He/she can perform subject presentation, prepare personalized exercises and test questions.

The student user listens to lesson after entering the fields of personal information display screens. The material data is entered to the parametric fields and the student specific learning material screen is displayed for each student.

The student user defined in the Personalized Learning Material Generation System, can access to learning material which has been transferred to the system by instructor only after he/she replies the personal questions about himself/herself. The students can access the subject presentation and the exercises. He/She can enter the answers to these exercises and get feedback about the correctness of the answers. After the subject presentation and exercises, the student takes the test of the subject and can check assessment results.

### III. CONCLUSION

As a consequence, with the Personalized Learning Material Generation System, the lessons, exercises and tests can be personalized keeping the semantic and structural coherence, for every subject and for each student who has an entry in the system, lesson presentations which includes parts from the student's life can be prepared. Thanks to learning method, the attention of the student is drawn and the objects, people and numbers in his/her daily life are transferred to his/her education life. It is known that, this learning method raises the learning attitude and motivation for mathematical verbal problems. It is proposed that, it is possible to generate personalized material for the other lessons with this system.

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