Work in Progress - The Study of Web-based Adaptive Feedback based on the Analysis of Individual Differences

Hyunjong Choe¹, Youngkwon Bae², Taeyoung Kim³ and Taewuk Lee ⁴
Korea National University of Education, Dept. of Computer Education,
Chungbuk, 363-791, South Korea

Abstract – To demonstrate the feasibility of Web-based adaptive feedback, our study exploits the individual differences as a solution. However, the implicit characteristics of individual make hard to derive an explicit model. In many countries, primary, secondary and high school students undergo a standardized personality and aptitude test. This test guarantees reliability and validity, and the result of it shows various aspects of personal characters and aptitudes. Thus, we think that the results of the standardized test can be used to differentiate individuals in the class. From the standardized test results, seven general cognitive and aptitude factors are selected, and then, we relate those factors to feedback types. Also we design a Web-based performance assessment system to evaluate our proposed method. We are going to apply this system to the students in a secondary school for evaluating our proposed adaptive feedback model in a Web-based environment.

Index Terms – Adaptive feedback, Cognitive factors, Individual differences, Web-based learning

INTRODUCTION

The important characteristic of the feedback communication is to provide information to the learners about the correctness and performance of their learning process[1]. Therefore, many Web-based learning systems are designed to provide such feedback automatically and immediately.

The Web-based learning systems have recently an additional module in contrast to older ones; the learner’s profile module which has important information on learner’s educational activity and his/her personal learning characteristics[2]. This information can be used to make learning adaptive.

To demonstrate the feasibility of Web-based adaptive feedback, our study exploits the individual differences as a solution. We consider that human has many multi-dimensional learning characteristics, such as knowledge, attitude and skill.

TABLE I

<table>
<thead>
<tr>
<th>FACTORS OF DIFFERENTIATING INDIVIDUALS AND FEEDBACK TYPES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive factors</td>
</tr>
<tr>
<td>Comprehension</td>
</tr>
<tr>
<td>Arithmetic faculty</td>
</tr>
<tr>
<td>Thinking power</td>
</tr>
<tr>
<td>Practical faculty</td>
</tr>
<tr>
<td>Investigation</td>
</tr>
<tr>
<td>Logical faculty</td>
</tr>
<tr>
<td>Creativity</td>
</tr>
</tbody>
</table>


To design a strategy for providing adaptive feedback to students, the first step is to determine and measure the factors of individual differences, but the implicit characteristics of individual make hard to derive an explicit model.

Earlier studies on learning effects concerning individual differences consider the factors such as intelligence quotient (IQ), cognitive style, meta-cognition, learning style, prerequisite learning, and so on[3]-[5]. IQ is so simply quantified that it could be easily used as a factor of individual differences in a Web-based learning system, but it is too narrow representation of the learners. Other factors such as cognitive style, meta-cognition, learning style and prerequisite learning are too broad or abstract to be utilized as the factors of differentiating types of feedback. Which factors are the proper, general, and appropriate ones for differentiating learners? Further, it is needed to have a planned pre-test for determining individual’s level on such factors.

In many countries, primary, secondary and high school students undergo a standardized personality and aptitude test. This test guarantees reliability and validity, and the result of it shows various aspects of personal characters and aptitudes. Thus, we think that the results of the standardized test can be used to differentiate individuals in the class.

From the standardized test results, seven general cognitive and aptitude factors are selected by us; comprehension, arithmetic faculty, thinking power, practical faculty, investigation, logical faculty and creativity. Then, we relate those factors to feedback types based on several related works as shown in Table I. For example, “if comprehension is high then provide positive/negative feedback, else provide hint feedback”.

1 Hyunjong Choe, Ph.D. Student, Korea National University of Education, blueland@blue.knue.ac.kr
2 Youngkwon Bae, Ph.D. Student, Korea National University of Education, ynkw56@hotmail.com
3 Taeyoung Kim, Associate Professor, Korea National University of Education, tykim@knue.ac.kr
4 Taewuk Lee, Professor, Korea National University of Education, twlee@knue.ac.kr

October 20 – 23, 2004, Savannah, GA

34th ASEE/IEEE Frontiers in Education Conference

T2C-25
DESIGN OF A WEB-BASED ASSESSMENT SYSTEM

We design a Web-based performance assessment system to evaluate our proposed method. It provides adaptive feedback in a Web-based courseware that presents lectures and evaluates students’ achievement. Figure 1 shows the framework of our proposed system. The rounded rectangles show the information presented as input to or output from the process. The rectangles represent the process of the system.

The teacher designs the purpose, measures and situation of performance assessment. After a student logs on the system, it determines one or two student’s cognitive factors related to the objective of performance assessment in order to decide which type of feedback is the best-fitted one for the student. The system uses this information on feedback type as a main criterion to give users adaptive feedback. After finishing the processes of performance assessment, student’s achievements and his reactions to feedback are stored in the system and feedbacked to the student’s profile and the teacher.

CONCLUSION AND FURTHER WORK

At the present time, we formalized the relation of cognitive factors to feedback types, and the Web-based learning system has been implemented since then. We are going to apply this system to the students in a secondary school for evaluating our proposed adaptive feedback model in a Web-based environment. We believe that our study and implementation will give researchers another important case study of adaptive Web-based system based on the individual differences.

ACKNOWLEDGEMENT

This work was supported by Korea Research Foundation Grant (KRF-2003-030-B00014).

REFERENCES