Automatic generation of questions adapted to the personality and learning style of the students

Alberto Redondo-Hernández and Diana Pérez-Marín

Universidad Rey Juan Carlos, Madrid, Spain
{a.redondo.h@alumnos, diana.perez}urjc.es

Abstract. Students learn according to different learning styles. Moreover, they have different personality features. However, it is usually the case that they are always asked in the same way, irrespectively of their learning style or personality. In this paper, we present a procedure to automatically generate the questions of e-learning tests adapted to the learning style and personality of each student. It is our hypothesis that it will facilitate the assessment and students will be able to perceive that the generated questions are easier to understand and answer. A preliminary experiment with 10 students seems to provide evidence to support that hypothesis.

Keywords: conversational agent, learning style, personality, e-learning

1 Introduction

In our previous work, we have focused on the possiblity of adapting the dialogue to the student knowledge [1], that is, extracting information from the students' answers to e-learning systems to generate dialogues based on the concepts identified as less known by the students.

In this paper, we consider that the adaptation should not be just limited to the student knowledge, but that it is essential to take also into account the learning style of the student and the features of his/her personality. In particular, even when the adaptation to the student knowledge has identified that it is necessary to ask a question about a concept, it is our insight that the generated question can be furtherly adapted automatically so that different students get different questions.

For instance, if a conversational agent has identified that the student does not know the concept *thread* in Operating Systems. It could always generate the basic question: What is a *thread*? to start the educational dialogue on learning the concept, or, it could generate different questions depending on the learning style and personality of the student such as "Tell me about *threads*" if the student has an active personality, or show the student a visual image of a *thread* and ask him/her what the image represents if the learning style is visual.

It is our hypothesis that this will facilitate the assessment and students will be able to perceive that the generated questions are easier to understand and answer. Therefore, we have devised a procedure to automatically generate the questions of e-learning tests adapted to the learning style and personality of each student. A

preliminary experiment with 10 students seems to provide evidence to support that hypothesis. Moreover, the results achieved can be useful to give more insight into the study of how an effective conversation between the student and the agent look like.

2 Procedure

The proposed procedure follows these steps:

1) The student completes the Soloman-Felder learning styles test [2].

2) The student completes the Big Five personality test [3].

3) The teacher introduces a set of questions (the original questions, X).

4) New questions are generated according to several proposed patterns for each Soloman-Felder learning style and/or each of the Big Five personality features.

5) The student is asked the question adapted to his/her Soloman-Felder learning style and personality according to the tests.

The reason why these tests have been chosen is because they are quite common and accepted in their areas. In particular, the Soloman-Felder learning styles test identifies that a student can be:

- **Active**: the student understands better direct and short information. Therefore, the question generated for this type of student will be direct and short. For instance, “Tell me about X”.
- **Pasive**: the student prefers to think about the information on his/her own to process it. Therefore, the question generated for this type of student will make the student think. For instance, “Think about X” or “Take you time and then, tell me about X”.
- **Perceptive**: the student prefers to have facts that can sense. Therefore, the question generated for this type of student will be based on facts. For instance, “How do you see X?”.
- **Intuitive**: the student prefers to identify relationships. Therefore, the question generated for this type of student will be based on relationships. For instance, “It is evident that X”.
- **Visual**: the student prefers to see the information. Therefore, the question generated for this type of student will be based on images. For instance, “Imagine the following image, and then X”.
- **Verbal**: the student prefers to listen to the information. Therefore, the question generated for this type of student will be based on sounds. For instance, “Write about X”.
- **Global**: the student prefers to see all the connections in general, without focusing on the details. Therefore, in this case, the adaptation is not at the level of one question, but the program should show all the questions.
- **Sequential**: the student prefers to see the questions one by one in sequence. Therefore, as in the previous case, the adaptation is not at the level of one question, but the program should allow to show the questions one by one.

The Big Five personality test identifies that a student can be:

- **Extrovert:** the student has features such as talkative, assertive, happy.... Therefore, the question generated for this type of student will allow him/her to think that s/he is talking to a lot of people. For instance, “What would you say or a lot of people about X?”.
- **Introvert**: the student has features such as quiet, shy, reserved...Therefore, the question generated for this type of student will allow him/her to talk to him/herself. For instance, “For you, what about X?”.
- **Cordiality**: the student is pleasant, nice, likeable,… Therefore, the question generated for this type of student will allow him/her to talk to him/herself. For instance, “Could you help with X?”.
- **Antipathy**: the student is cold, unpleasant, distant, grumpy,…Therefore, the question generated for this type of student will allow him/her to have a cold challenge. For instance, “I am sure you are not able to talk about X”.
- **Responsibility**: the student is responsible, dependable, trustworthy... Therefore, the question generated for this type of student will ask him/her to help other people. For instance, “If you have to explain X to a friend, what would you say to him/her?”.
- **Disorganized:** the student is careless, neglected, forgetful…Therefore, the question generated for this type of student will help him/her to focus on the question. For instance, “X, what is it?”.
- **Emotional stability**: the student is constant, peaceful, tranquil... Therefore, the question generated for this type of student will ask him/her to help other people. For instance, “In the context of Y, what about X?”.
- **Neuroticism**: the student is anxious, nervous, worried...Therefore, the question generated for this type of student will try to keep him/her calm. For instance, “If you are asked about X, although you are not forced to answer, what would you say?”.
- **Open-minded**: the student has general interests, and s/he is imaginative, original, creative... Therefore, the question generated for this type of student will try to make him/her think open. For instance, “In general, imagine X, what can you say?”.
- **Convencionalism**: the student is ordinay, simple, superficial,…Therefore, the question generated for this type of student will narrow the possibilities down to a certain context. For instance, “According to Y, what can you say about X?”.

Figure 1 shows a snapshot of the procedure implemented in Flayer.

3 Discussion

Table 1 gathers the results of a preliminary experiment in which 10 students were asked to complete the tests and evaluate the generated questions. The experiment took 2 hours, after which they were asked two questions: if they have perceived the adaptation by showing them the original and generated questions adapted to their styles, and which their general opinion about the procedure was.

Figure 1. Snapshot of Flayer (on the left the styles, on the right the counter of questions generated and checked, above the original question 'Which are the type of skills that a child can develop during his life?', and below the generated question for a perceptive student 'How do you see that are the type of skills that a child can develop during his life?' with some buttons to modify, insert, delete or accept the question, and to log out).

Table 2. Results of the preliminary experiment

Student	Has s/he perceived the adaptation?	General opinion
1	Sometimes	I do not like it
2	Sometimes	It is interesting
3	Sometimes	It is interesting
4	Yes	It is good
5	Yes	It is interesting
6	Sometimes	It is good
7	Yes	I do not care
8	Sometimes	It is interesting
9	Yes	I do not like it
10	Yes	I do not care

As can be seen, all the students have perceived the adaptation sometimes, and 50% of them have always perceived it. In general, 60% of the students consider that the procedure is interesting or good, 20% do not care, and 20% dislike it because they would rather not take tests on their personality or learning style.

As future work, we would like to keep exploring the possibilities of the adaptation with different patterns and to study it the adaptation has some impact on the learning.

References

1. Hermida-Portales, C., Pérez-Marín, D., Pascual-Nieto, I.: Automatic Generation of Dialog Templates Adapted to the Student Knowledge. APLEC workshop, 2010.
2.Soloman-Felder learning styles test, available on-line at http://www.engr.ncsu.edu/learningstyles/ilsweb.html
3. Big Five personality test, available on-line at http://es.outofservice.com/bigfive/?srclang=en