Develop CbITS Using AutoTutor to Enhance Generic Concept Learning.

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INTRODUCTION

In this work, we present the application of AutoTutor in a consulting environment which seeks to educate those at clinical high-risk (CHR) for psychosis on four key concepts about the relationship between genetic risk and psychosis development. A new module in AutoTutor was built to support one-to-one consulting environment for student to learning better. To support the non-expertise, a Sime-authoring free tools are used to reduce the authoring burden from biology experts. The tool can also be used to build the logic matching rules and performance optimization A pilot study is carried using AutoTutor. The result provides a high accuracy and promising application in genetic learning.

RELEVANT THEORIES

ICAP Framework

ICAP framework defined engagement in terms of overt behaviors that students can undertake, and teachers can see. ICAP represents the name of four engagement behavior modes: interactive, constructive, active, or passive. According to ICAP framework, each mode can predict and have different level of learning: Interactive mode of engagement achieves the greatest level of learning, greater than the Constructive mode, which is greater than the Active mode, which also is greater than the Passive mode. That is I>C>A>P which proves the effectiveness of ITS.

AutoTutor

AutoTutor is a conversation-based Intelligent Tutoring System (CbITS) that holds conversations with students in knowledge domains. AutoTutor's interactive dialogues center on pedagogic questions to elicit explanations from the user's perspective by employing latent semantic analysis (LSA). Tailored feedback is provided basing on the evaluation of user's input. Based on the quality of the input, user will receive different hint or prompt questions following specific design rules. Through more than twenty years research, the average learning gain using AutoTutor is around 0.8σ.

Content Authoring

Authoring is always one of the hot topics in ITS, especially when technology is explosive developing. Basing on the number of multimedia and platform of the ITS, the difficulty of authoring may vary. But it is true that more experts from different domains are needed to have a qualified content learning object be done. So, it is very important and helpful to develop such a tool or sub-system to reduce the burden from content authoring and lower the barrier for the users.

Research and methods

Methods

The initial training phrases and keywords were collected by the participants (N = 54) recruited from the Center for Prevention and Evaluation (COPE), the prodromal clinic at Columbia University. Five human judgers classify each of them and provide the corresponding category using correct (C) and incorrect (A). 109 short phrases and keywords are generated. The semantic space of genetic risk and psychosis is generated using seed method based on the seeds collected and expanded using English wiki Corpus. Then a pilot test was run to test the performance of AutoTutor using the new consulting environment module.

Experiments

The new AutoTutor module for information delivery is developed to form the one-to-one consulting environment to learning the genetic risk and psychosis concepts. The pilot tested with 25 graduate respondents to provide feasibility testing using the AutoTutor new module. Each respondent will be provided appropriate feedback and prompts to elevate their original answer for twice. The new module will guide them to achieve the correct answer after multiple attempts.

Results

In our pilot study (N= 25 college and graduate students), the new module could help all participants to answer the question correctly.

To improve the performance of AutoTutor, a new tool is designed to help non natural language processing expert to visualize the process and improve the accuracy of the evaluation of users' input. By using the tool, any content developer could be able to change the matching rules, set up the conditions, and get the final accuracy in a minute. It greatly improved the content development period, avoid unnecessary communication, and have fully control on the system by user own. It is no longer a black box for AutoTutor users.

REAL WORLD APPLICATIONS

Adaptive instruction system has great potential in the current situation: not only in current pandemic, but also the tendency of online learning in the future. The traditional education has great learning gain. However, it has limitation as well. It is hard for a teacher to tailor the instruction material for each individual student in a class immediately. Thus, intelligent tutoring systems could play an important role to create adaptive learning content basing on a student' learning status. Teacher, on the other hand, need to take the charge of creating learning content for students in a genetic way. It is hard for a teacher to create a pedagogic learning using different technologies out of his/her expertise. It is important for people to develop user-friendly tools and subsystem to aid them.

FUTUER

In the future, the whole four concepts under the topic of the genetic risk and psychosis would be developed and refined by the team. Testing will be run to collect data corresponding to the performance of the matching system. Meanwhile, a self-

learning system might be integrated basing on xAPI to further enhance the performance of AutoTutor.

SUMMARY

Using AutoTutor to convey genetic risk information for developing psychosis to CHR individuals could potentially provide education about genetic risk factors. Via our pilot data, the new 'multi-interaction' module in our AutoTutor platform can recognize genetic concepts accurately. Further development of this tool could help offset the scarcity of genetic counselors in low-resourced areas. The novel use of a multi-interaction module constructed from interview transcripts offers a promising development in tailoring intelligent tutor systems to the needs of a specific population.

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