Rashi Game: Towards an Effective Educational 3D Gaming Experience

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***Abstract*—We present an educational 3D game called Rashi Game, which instructs students via exploration using the inquiry teaching method. We first describe the Rashi Intelligent Tutoring System in its original form, and then describe the details and features of Rashi Game, the 3D game that we have developed. In particular, we argue that inquiry-learning environments are particularly viable for educational 3D games. This is because of the similarities between some common game mechanics and the inquiry-learning paradigm. These include freedom to explore open-ended environments, interaction with environments, and realistic scenarios. We briefly summarizing results that have been obtained via pilot studies of the efficacy of Rashi Game, and remark on what directions future work in educational 3D games might take.**

Keywords-Serious Games; Web Services; Intelligent Tutoring; Inquiry Learning

I. INTRODUCTION

Serious games (those made for a purpose other than pure entertainment) are a potential medium for increasing motivation and engagement in some students. However, the development of fully interactive games is difficult, and it is often unclear how to fit together aspects of gaming and pedagogy. In this paper, we briefly argue that the development of educational simulations for inquiry learning environments is relatively natural. We present the Rashi Inquiry Learning Environment, describe how it was converted to an educational 3D game, and briefly describe results from pilot study.

II. RASHI: THE INQUIRY TUTOR

Rashi is an inquiry tutor that teaches students through exploration and case based reasoning. Rashi teaches human anatomy through a problem-based environment [1]. The system provides tools to support students while they engage in diagnoses of diseases, including tools to explore and collect data (Patient Examination, Interview Tool, and Virtual Laboratory Tests), cognitive tools to support formalizing arguments and clarifying thought process (Inquiry /Argument Notebook), and collaboration tools that allow students to discuss and share work. Students can collaborate using a free text forum, as well as an in-notebook content dependent critique rebuttal tool.

Students explore cases, form hypotheses about diseases, and gather data to support or refute those hypotheses. This tutor uses an expert knowledge base to recognize (with 88% success rate) when students are discussing content relevant to the patient's problem and to correctly link (with 70% success) that content with an actual medical topic [1].

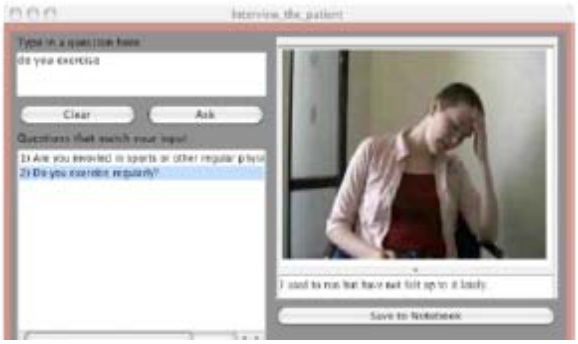

Figure 1: Students can interview the patient using the Rashi 2D client

Rashi is domain independent, and thus all of its features are fully generalized to afford to the needs of almost any realistic case based scenario in any subject. Cases have been implemented for Art History, Geology, Human Biology, and Forestry.

III. RASHI GAME: A 3D INTERACTIVE ADVENTURE

Rashi game was designed to demonstrate the natural development of games for inquiry learning, and to provide a new 3D interface to the system. The game was developed using a 3D gaming engine called IRRLicht [2]. In Rashi game, students take on the role of a doctor who must diagnose a patient in a virtual hospital. The hospital contains several rooms (lobby, laboratory, patient room, etc). Students move their character to various rooms to access Rashi Game's tools. In the normal Rashi system, students use open menus to access tools by clicking interface buttons.

Speaking with the receptionist yields the case description. In the patient room, the player can ask the patient questions, and perform physical examinations. In the laboratory, students can perform necessary lab tests. In addition, students can organize their data and argument in a notebook, very much like the original Rashi notebook.

Lastly, students can utilize advice from Rashi's coaching module by speaking with a fellow doctor who also works at

the hospital named 'Robert'. By speaking with Robert, students obtain advice regarding their hypotheses.

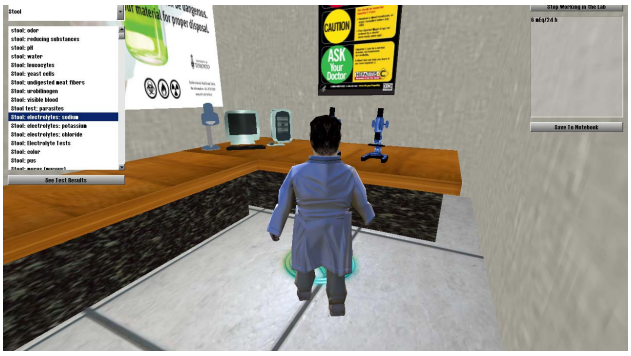

Figure 2: Students perform lab tests in a virtual lab in the Rashi Game

This development was natural because Rashi's inquiry learning setting is naturally exploratory. In fact, the tutor is designed to mimic the life of a real doctor, and so the creation of a 3D interface that reflected the setting of a doctor was straightforward. Inquiry cases often mimic real life scenarios, and so the development of technologies that simulate these scenarios with high fidelity is straightforward.

IV. Results of Pilot Studies

We performed a pilot study on the efficacy of Rashi Game in a classroom setting. The study attempted to measure how students performed when using the 2D Rashi Client as well as Rashi Game. We observed that students performed approximately the same amount of work when using both interfaces (1.8 and 1.6 hypotheses created on average). In addition, we asked students to rate the two interfaces by answering a questionnaire designed to measure their sense of 'presence' [3]. We also asked students to rate themselves as someone who is a game player, someone who doesn't play games but is open to the idea, or as someone who dislikes games. We found that students who don't play games but are open to them reported being more engaged by Rashi Game than their peers. Students reported being motivated in a way that aligned perfectly with their reported feelings about gaming. Gamers were the most motivated while non-gamers were the least. Overall, students reported that the game was more involving than its 2-dimensional counterpart.

Due to small sample sizes, we cannot present statistically significant results, however we do believe that these results imply potential effect between students prior experience with virtual environments and how the students react to a serious game. Some of these results are potentially interesting. In our pilot study, students who dislike games found the game to be more mentally immersive than the 2D game. In fact, the level of mental immersion was inversely related to how much a student enjoyed playing games. This is contrary to our intuition.

V. Conclusion

In conclusion, we demonstrated a generalized domain-independent inquiry tutor called Rashi. We have developed an educational 3D game that utilizes this service. It is our hope that this work will begin to show the benefits of 3D games moving forward. It is unlikely that games will become a dominant teaching strategy. However, we feel that Rashi Game provides evidence that interesting and rewarding activities, such as games, have an important role in an educational framework, and that modeling this relationship to develop a strategy for when and how to present games to students is both realistic and beneficial.

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