ARTICLE INFO

Article history:
Received 19 December 2015
Accepted 2 May 2017
Available online xxx

Keywords:
PSICO-A
Computer system
Educational psychology

UN SISTEMA INFORMÁTICO INTEGRADO PARA ENSEÑAR PSICOLOGÍA

PSICO-A is a computer system designed for teaching Psychology. It is a pioneering system in this area that combines simulations, digital games, and various educational influences. Taking agent-based systems like MetaTutor (Azevedo, Witherspoon, Chauncey, Burkett, & Fike, 2009), Betty's Brain (Davis, Leelawong, Belynke, & Bodenheimer, 2003) and REAL (Bai, Black, & Vitale, 2007) as a reference, it is a modular design system that introduces games and simulations inspired by Black's (1992) "representational theory", according to which knowledge is best represented through images (Finke, 1989) and mental models (Gentner & Stevens, 1983) that configure virtual learning environments (Jonassen & Land, 2012).

PSICO-A in turn introduces teaching tools of proven value for improving learning like concept maps (Novak, 1977), free memory retrieval (Karpicke & Blunt, 2011), a mechanism of self-generated "feedback" (Simeoni & Graf, 1978), and the emphasis on metacognition (Dunlosky & Metcalfe, 2008) through the ideas of the global metacognitive model of Mayor, Suengas, and González Marqués (1993). In general, we can say that its design is founded on the constructivist paradigm of Ausubel's (1968) learning.

The system has been described in González Marqués and Pelta (2013) and presents to virtual agents being involved in simulations and digital games. While simulations "are structured environments, abstracted from some specific real-life activity, with stated levels and goals" (Aldrich, 2009), computer-based learning games are "applications using the characteristics of video and computer games to create engaging and immersive learning experiences for delivering specified learning goals, outcomes, and
experiences” (de Freitas, 2006). Computer games are interactive experiences that are fun to engage while educational simulations usually develop skills and capabilities more rigorously. In PSICO-A simulations and games are based on genuine theories (Hull, 1952) and experiments (Crespi, 1945).

Reflection Mode allows the student to verify the accuracy of their learning. The system asks them a series of questions. The student responses are scored in the Reflection Mode and the adjusted score Analyzer of the system back-end are also reflected in the Learning Assessment Module. This module finds the correct response or no response, also from the “feedback” given to the student in Reflection Mode, rephrasing the question in case of failures. In the Concept Maps Design window (Cañás, 2004), concepts will be distributed on the screen. There are three kinds of conceptual relations in form of arrows: a type of causal relationship, a type of hierarchical relationship, and a descriptive class of relationship (Leelawong & Biswas, 2008). As the student chooses the concepts, the boxes containing the same concepts on the screen are drawn out and the student traces the connections between them using the above types of arrows. The screen Concept Map Editor displays the number of concept boxes and arrows of various kinds that the subject has inserted at the end of the task, specifying the names of ones as well as others. In the central part of the main display area is a “start button” which, when activated, generates above a button “Learning” and the Didactic Unit to study.

By clicking on the button “Learning” from the top center, the Didactic Unit window disappears and “Prior Knowledge”, Notepad”, “Confidence Judgments”, “Metacognitive Judgments”, and “Evaluation” buttons come up. In “Prior Knowledge”, the subject has to state whether she knew anything about the topic before studying it and what (background information). The Notepad is a free recovery exercise of what is studied (Karpicke & Blunt, 2011). This is one of the strengths of PSICO-A: comprehensive training conjugation with retentive learning.

The “Confidence Judgments” button displays a window that asks the subject to enter their degree of confidence (as a percentage) in their learning of the Didactic Unit (Dunlosky & Metcalfe, 2008). The Metacognitive Judgments area consists of 10 questions (Mayor et al., 1993), for which the student must choose and check one of four options that are recorded.

The back-end or interface of the teacher is the heart of the computational system. Its core is a student performance Analyzer that allows the interpretation and verification of their texts given in natural language.

In this article our objective is to determine the effectiveness of PSICO-A on learning versus the classical method based on teacher explanations.

Method

Participants and Materials

The participants were 104 students (average age = 17.6) of Psychology as an optional choice in the second year of A-level of two high schools in Madrid. The curricular material used came from the A-level Psychology textbook (Alonso, 2012). The 33 students in the control group (CG) received regular instruction as in a standard class. Students in the experimental groups (EGI and EGII) were randomly selected from two groups of students of Psychology as an optional choice. With the EGI group (36 students) used the computer learning system of Psychology, PSICO-A, with the difference that instead of using the simulation, the students used the game. Meanwhile the EGII group, consisting of 35 students, also used PSICO-A but accessing the simulation, not the game.

Design

As independent variables, the study included three different combinations of education systems, PSICO-A+Game, PSICO-A+Simulation, and Lectures (it is thus treated, as a multi-group design). The dependent variable was the students’ performance in the following parameters related to learning: confidence judgments, metacognitive judgments, number of concepts generated in Notepad, fidelity of the definitions given to these concepts, number of concepts on the concept map, percentage of correct conceptual relationships and percentage of correct answers in the Reflection Mode. All groups carried out a pre-treatment before starting the experiment (phase 1). This pre-treatment was used as a covariate control analysis of individual differences. Once the two experimental groups were treated using PSICO-A and the control group received the standard class of the same content, the three groups carried out the post-treatment (phase 2). Finally, all were subjected to a monitoring test of what they had learnt in the previous phase (phase 3) consisting of 30 multiple-choice questions, each with three options. Before the completion of the pre-treatment, the students of all three groups received an explanation with questions of part 5.3, Experimental Method, of Unit 1 (Alonso, 2012). All the sessions took place on a day when there was no interference with examinations or tests of other subjects. The meetings were performed in parallel, i.e., the same day, the same time, with two teachers attending the sessions in the computer room.

Results

We have used the SPSS 14.0 statistical program and have accepted a degree of significance of .05. A test of homogeneity variances or Levene’s test and an One-Way ANOVA were used to determine if there was a significant difference in the pre-treatment received by the groups. After evaluating the results, there were no significant differences between groups in any of the categories; in other words, they were homogeneous groups regarding their performance on the test.

In the post-treatment and in the corresponding follow-up test, the same parameters as in the pre-treatment were evaluated. In each case, an One-Way ANOVA and a Tukey’s HSD test for comparison between groups were applied. Besides, Eta-squared, the most common measure of effect size for One-Way ANOVA, was applied. We now analyze the results by different parameters or categories.

In confidence judgments there was no significant difference between groups. In the post-treatment, the group that expressed greater confidence in their learning was the EGII group, with a percentage of 69.14.

In metacognitive judgments there was simply a marginally significant difference between groups. In the post-treatment test the results of the three groups significantly improved regarding the points scored in the initial test. The EGI group achieved the highest average, with 7.70 out of 10 points, compared to 7.52 of the EGII group and 7.18 of the control group (CG). See Figure 1.

In the section related to the number of concepts in the Notepad, in the post-treatment, the One-Way ANOVA indicated the existence of a significant difference between groups and Tukey’s HSD specified such difference between groups, favoring the two experimental groups compared to the control group. Using eta-squared, 69% of the total variance was accounted for the treatment effect (\(\eta^2 = .69\)). The difference remained on the following up test (see Table 1).

Regarding the concepts’ definitional loyalty or percentage of correct definitions of the concepts carried out by the individuals in the free memory of the Notepad, the One-Way ANOVA, F(2, 101) = 26.320, p < 0.000, and Tukey’s HSD applied to post-treatment showed significant differences between groups in favor of the EGI
دریافت فوری متن کامل مقاله

امکان دانلود نسخه تمام متن مقالات انگلیسی
امکان دانلود نسخه ترجمه شده مقالات
پذیرش سفارش ترجمه تخصصی
امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
امکان دانلود رایگان ۲ صفحه اول هر مقاله
امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
دانلود فوری مقاله پس از پرداخت آنلاین
پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات